THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXX. No. 1793.] LONDON, SEPTEMBER 21, 1897. [49TH YEAR. PRICE 6d.

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AND ALL PURPOSES,
ALSO
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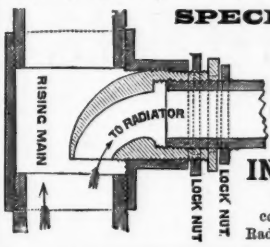

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(Signed) JOHN H. BARKER.
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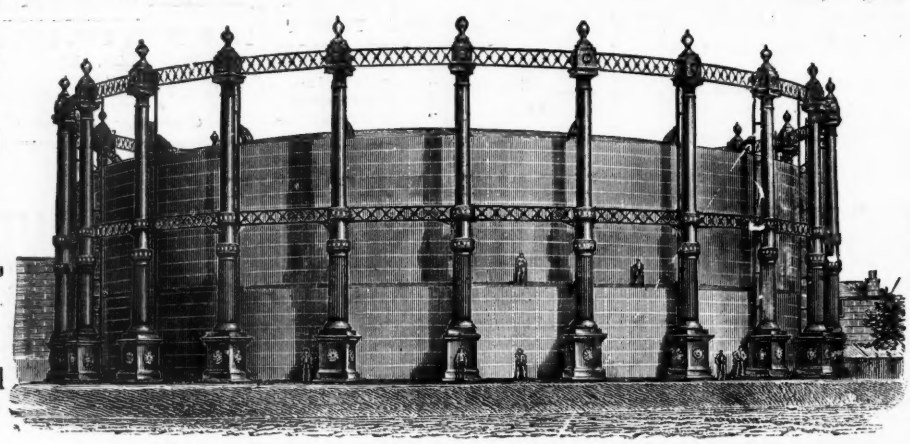

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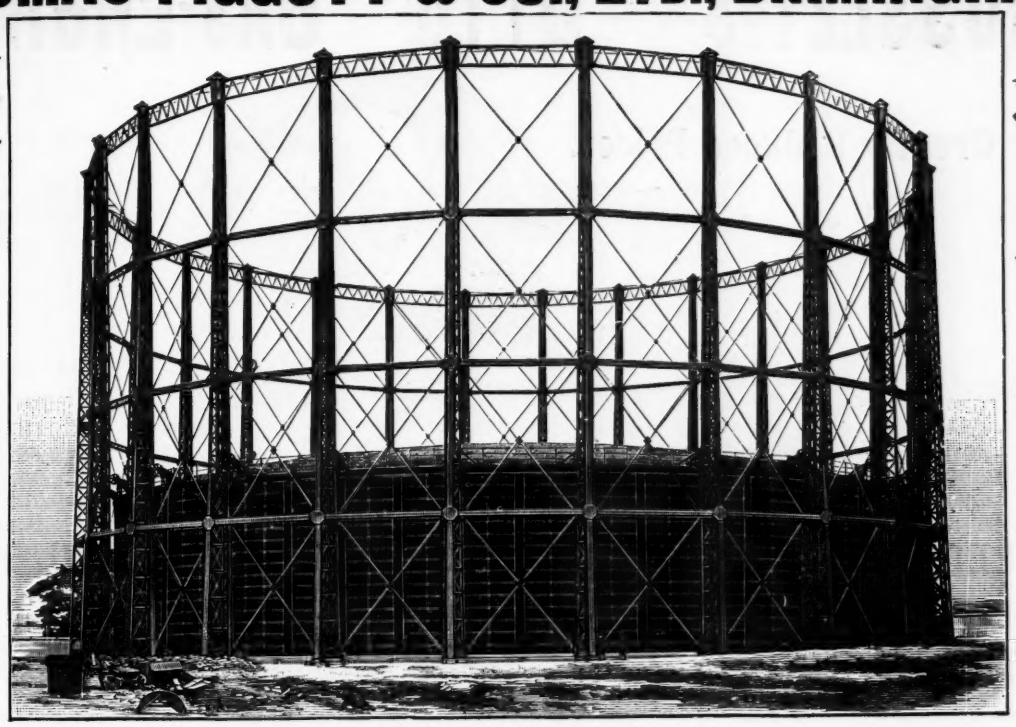

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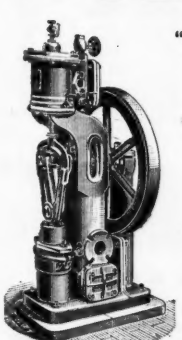

Fig. 705. "SINGLE RAM" STEAM-PUMP.

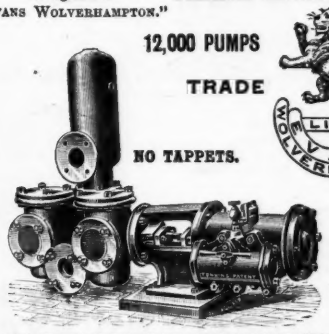

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER [FEEDING, &c.]

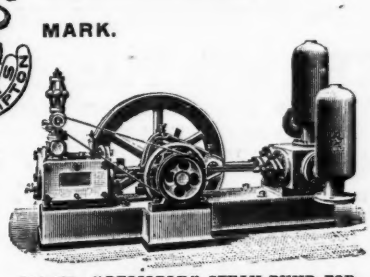

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

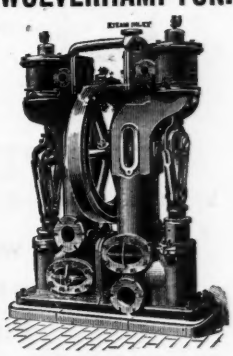

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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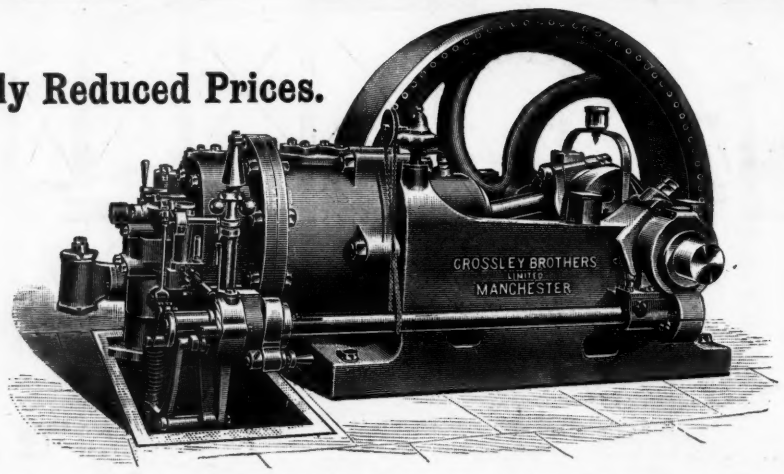

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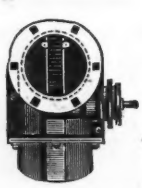

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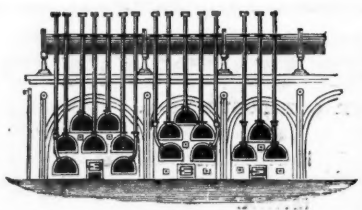

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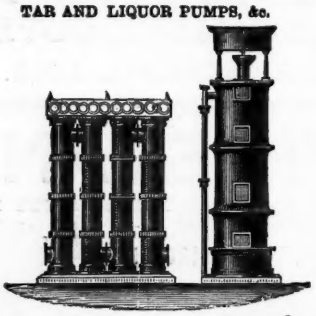

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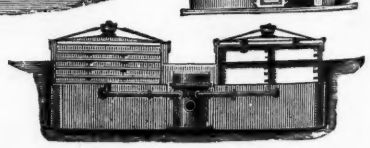

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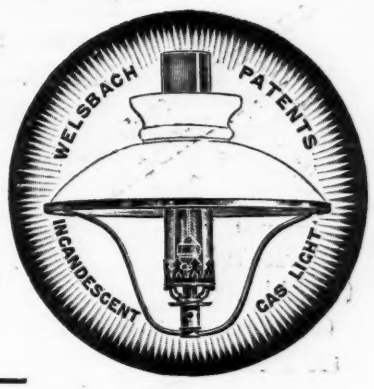

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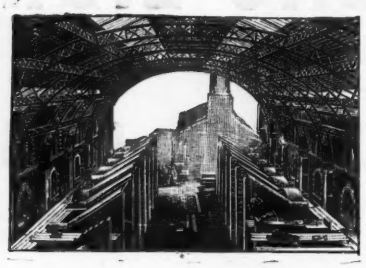

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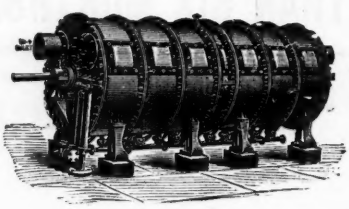

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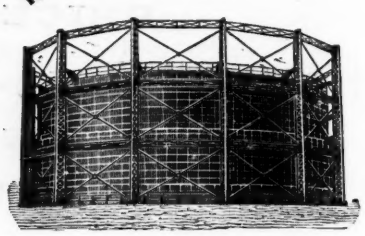

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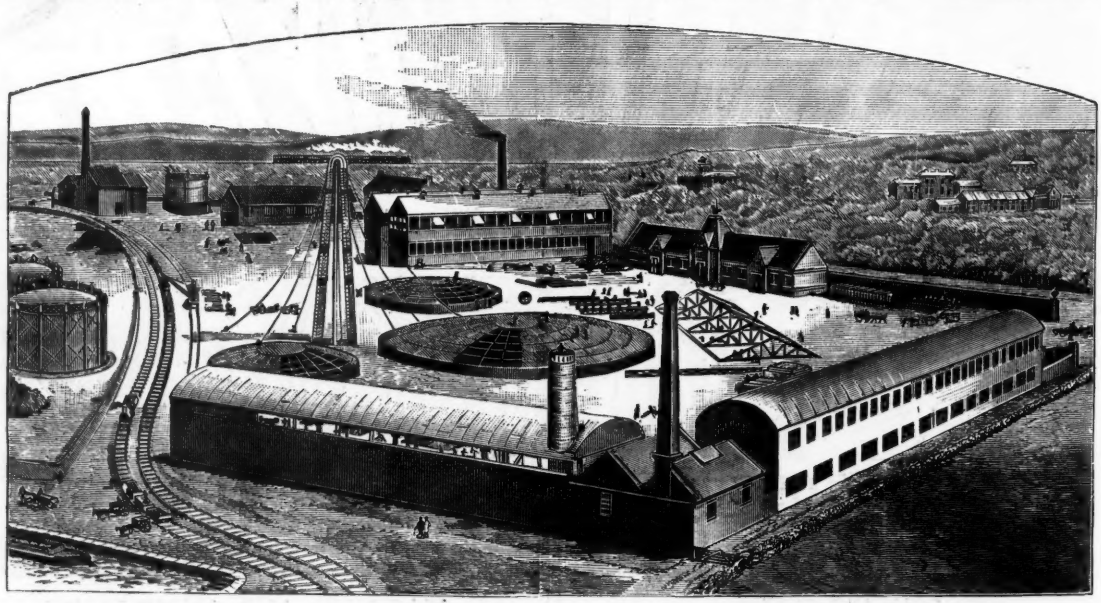

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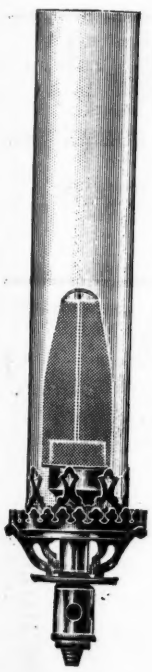

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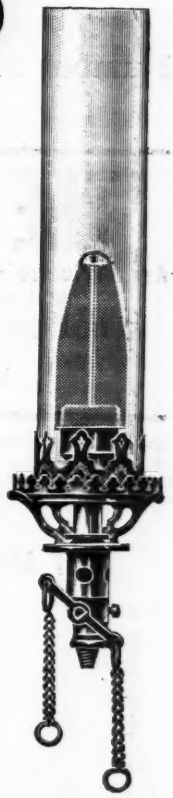

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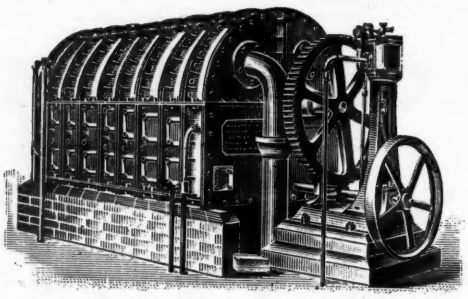

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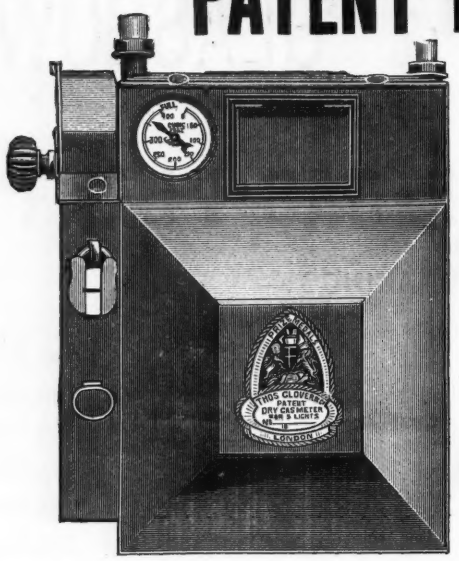

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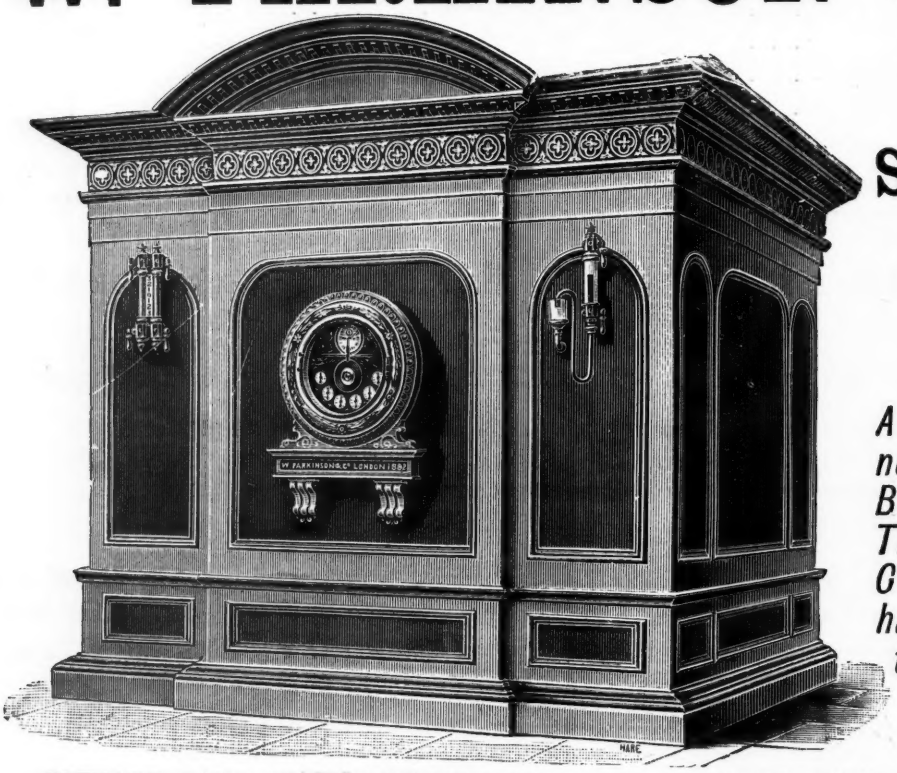

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[See also Advt., p. 660.

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EDITORIAL NOTES.

The Burden of Acetylene.

THE character of the "Register of Patents" which has run through the pages of the "JOURNAL" of late is worthy of some remark. Week after week it has been our duty to chronicle more, and still more, patents for acetylene gas generators, until the list, like that of the Kings seen in vision by Macbeth, bids fair to stretch out till the "crack of doom." The phrase seems particularly appropriate in this connection, inasmuch as if a reasonable proportion of these patented acetylene producers were to get into general use, the "crack of doom" would most certainly be heard in many households. It seems worth while to ask, What is the good of all this? What useful purpose do the patentees of these innumerable "dodges" for the preparation of acetylene by the action of water upon calcium carbide, think to fulfil by their persevering efforts—endeavours worthy of a very much better cause? Who wants to make acetylene "anyhow," as the American language has it; and if he does, which is the necessary patent under which he must proceed? Let us take this opportunity of recapitulating the actual state of commercial acetylene, and consider the prospects of the patentees of calcium carbide and acetylene apparatus. In the first place, there is no property in the manufacture of calcium carbide. There is, we believe, a popular belief abroad that the preparation of calcium carbide, or its use for the production of acetylene, was discovered by Mr. T. L. Willson, an American. This is an error. It is not for us to discuss here the validity of the patent for the production of calcium carbide taken out by Mr. Willson in 1894; but, as a matter of history, Wöhler made the compound, and observed its reaction with water, in 1836. Willson's claim to priority with regard to his actual methods was disputed from the first by Moissan, who has made nearly everything that can be made by the aid of the electric furnace. Up to the present time, nobody has attempted to prevent anybody else from making calcium carbide; and it is actually being manufactured in several places by people having no commercial relations with each other. If a Carbide of Calcium Manufacturing Company were to come before the public to-morrow, and ask for capital to be embarked in this business, it would be as clearly our duty to inquire, as a journal, into the claims advanced by such a Company, as it was some years ago to expose the pretensions of Samson Fox's Water-Gas Companies to possess the monopoly of this manufacture.

If, on the face of it, there is no monopoly in carbide of calcium manufacture in itself, what else can be said of the production of acetylene from this interesting compound? Simply that the preparation of acetylene from calcium carbide by wetting it with water, is as simple a reaction as the obtaining of hydrogen from zinc and dilute acid. The preparation and use of compressed acetylene is not a commercial possibility by reason of the great risk of explosion. Also, the danger of fire and explosion stands in the way of the employment of calcium carbide for the production of acetylene, or the handling of acetylene itself for any purpose except in very small quantity or bulk. That acetylene can be prepared and used in small quantity with a reasonable degree of safety, is quite true, provided that certain precautions and conditions are duly observed and secured. Thus, if the calcium carbide is pure—not chemically pure, of course, but of what might be called a high grade of commercial purity; if it is caused to generate acetylene in the cool, and in the quantity required for use or safe storage; if the generating apparatus is sound, and the gas cannot be accumulated under greater pressure than that of a few tenths of water—then the process of producing and burning acetylene need not necessarily be attended with danger. But where is the need for a patent to secure all this, as well as it can be secured by mechanical means? The safe generation of acetylene from calcium carbide consists, according to Pictet, in putting a small quantity of the carbide into a comparatively large quantity of water; while there is danger in reversing the conditions. The inference is obvious. Nobody can patent a chemical reaction; and hence everybody is perfectly at liberty to make acetylene, at his own peril, and in his own way.

The crowding of patentees after one another in a matter of this kind, is like that of a flock of sheep; and it is equally unintelligent. One piece of apparatus may make

its product as cheaply as another, but not more so. One is just as safe as another, or as unsafe. What the patentees of the multitudinous acetylene generators think to gain by their endeavours, it is impossible to surmise. Their effort is like nothing so much as that of the participants in the hollow prize competitions that fill the modern popular or domestic periodicals, proposing the solution of puzzles that are not puzzling at all. Anybody can do it; and those who make the attempt, only learn after long delay that so many have succeeded that the infinitesimal proportion of the reward due to everyone is not worth the having. So it is with acetylene production, unless we are greatly mistaken.

Foreign Competition with English Engineering.

THERE has been no subject more acrimoniously debated during the progress of the strike in the engineering trade than that of the extent to which the English branch of this industry is liable to be affected by European and American competition. According to the view officially adopted by the strike leaders, the English mechanic is so superior a person, and the pre-eminence of English shops so assured, that nothing the former can do will lastingly affect the commercial prosperity of the latter. Not only can the British workman strike as often as he pleases upon this showing, but he can also safely go on indulging *ad libitum* in all the other vagaries believed by the employers to be actively encouraged by his Trade Unions—such as doing as little work as possible, limiting the output of self-acting machines, and scheming fresh delimitations of his fields of activity. The employers do not view the prospect in the same light, and declare that what it pleases Messrs. Barnes and Burns to style the "bogey of foreign competition," is anything but an imaginary terror. Referring to the conditions of the mechanical trades in Belgium—one of our nearest and keenest competitors for International business—it is a serious fact that the men work 60 hours a week for about 25 per cent. lower wages than London rates. On the other side, the industrial conditions now prevailing in the United States are of a totally different character. The large employers at Pittsburg—such as the Carnegie Company, have passed through labour troubles to which that now existing in the English engineering trade is a trifle. The American Trade Unions were much more formidable organizations than the English societies. They were inspired by the same misty German Socialistic ideas; but the orders of the leaders to their serfs were more ruthless and sweeping than anything that has ever been heard of here, even during the paling times of the Sheffield Saw-Grinders' Union. At last it came to a matter of Gatlings and repeating rifles; and in the end, the employers won back the power of managing their business in their own way. One patent result of this victory is that the Carnegie blast-furnaces are constructed on a scale unapproached in this or any other country; and the same Company are delivering steel rails in Calcutta for less than the selling price of such rails in England.

Of course, the Protective system of the United States helps the large manufacturers to do a cutting export trade. English manufacturers of the same commodities may be sincerely thankful for the United States tariff, and pray for its continuance. For the day that sees this incubus removed from the engineering and general metal trades of the United States, will herald a period of fiercer competition for business than our manufacturers have ever yet experienced. It is absurd to pretend that such firms as the Carnegie Company, and half-a-dozen others that might be named, need Protection. To take as an illustration merely the trade in gas-works requirements—it is certain that the gas undertakings of the United States have as cheap a market to go to for most of their material equipment as can be found on this side of the Atlantic. At the present time, American specialities of various kinds are in the English market; and we are prepared to learn any day that large English contracts for mains, valves, and gasholders have gone to Pittsburg. It can be done quite well. There is reason to believe that any English gas-works accessible by sea could receive many descriptions of American goods at as cheap a price as the same articles are listed by home manufacturers.

There might be for a time a little sentimental objection to such a diversion of orders and sending large sums of money out of the country. But buyers quickly accustom themselves to dealing with the foreigner, or anybody else who will serve them to advantage. The construction of the first American gasholder in England, will be an epoch-marking event; and whenever it is done, it is to be hoped that the structure will be plainly labelled "Made in the "United States." This is the sort of thing to rouse manufacturers and workmen out of the Fool's Paradise in which short-sighted agitators like the wire-pullers of the A.S.E. would lap them.

Gas Affairs at Burton-on-Trent.

THE gas supply of Burton-on-Trent has formed the subject of sharp debate in the Town Council, as reported in our pages last week. At the recent monthly meeting of the Council, Alderman Lowe, the Chairman of the Gas Committee, moved that the price of gas should be reduced; and the manner in which the proposal was received, is a striking indication of the way in which Local Authorities are wont to regard the claims of consumers of their gas. Alderman Lowe prefaced his speech with the observation that it would be superfluous to advocate the policy that gas-works ought to be in the hands of Corporations. But we venture to suggest that his own statement, and the remarks of his fellow councillors, contain ample food for the reflection that there are two sides to this question. The Burton Gas-Works have been in the hands of the Corporation for a considerable period; and Alderman Lowe confessed that the Corporation had not always appreciated the value of the property. In 1885, it was considered necessary to enlarge the works; but the "pro-"posal was strenuously opposed by many of the leading "members of the Council, who based their attitude upon "the depressed state of the staple trade of the town, and "the possible introduction, sooner or later—and sooner "rather than later—of the electric light. It was said, "eleven or twelve years ago, that gas was a failing light, "and there would be a gradual decrease in consumption." If the "staple trade of the town" previously alluded to means the brewing of beer, as it probably does, the elected wisdom of Burton cannot be greatly complimented on its perspicacity. What could the Burton magnates be thinking of, to fear that beer would ever go out of fashion? If they feared for beer, of course they might have been excused for feeling nervous on the score of gas. But what timidity, to doubt the perpetual popularity of either product! The fact is, however, the Burton Corporation have all along squeezed their gas undertaking so severely that, as commonly happens, they began to be afraid of the subject of their maltreatment. They have made the gas consumers buy a sewage farm at a cost of £10,000, and spend £5000 upon flood works. The same helpless contributories paid for the Park Hill Estate; and altogether, "by the aid of the gas profits, funds had been provided for "the carrying out of important works, some of which he "(the Alderman) did not hesitate to say would not have "been possible without them, as they *could not have been* "*legally paid for out of the rates.*" The italics are ours.

After this, can it be doubted that it has been highly expedient—for somebody—that the Burton gas undertaking should have been appropriated by the Corporation? But the advantage has not been on the side of the gas consumers. Yet Alderman Lowe had as much as he could do to persuade the Council to give the consumers the benefit of a little reduction of price. He was only able to do this by proclaiming his abhorrence of the heresy that gas should be sold at cost price. He trotted out the old bugbear about the ratepayers as a whole being responsible for any deficit of the gas revenue—conveniently forgetting his previous story, that at the only time since the undertaking became public property when there was any difficulty in making both ends meet, the price of gas had been promptly raised to meet the emergency; and eventually he had his reward. The gas consumers of Burton should be grateful to the Chairman of their Gas Committee. He still leaves them to pay about £5000 a year in aid of the rates—that is to say, those ratepayers who consume the town's gas are surtaxed to this amount—but he has more consideration for their state than many other members of the Council. There is a member of Parliament on the Burton Council—Alderman Evershed—and he took up a position "on the fence," in quite the most approved parliamentary style. He would not vote against the proposal of the Committee; but all the same he poured cold water upon it, and argued against the idea that any reduction at all was necessary. The present price was a "moderate"

one; the rates were high, and getting higher; and—most wonderful reason of all—"he was against any reduction, "because there had been no request from any quarter for "such reduction, and it was somewhat unusual for a "public body to lower their prices when they were not "asked to do so." In other words, there is never to be any lowering of the price of an article which is a practical monopoly without agitation, complaints, and general unpleasantness. Alderman Evershed ought certainly to be Postmaster-General or Chairman of the Midland Railway Company. It is, however, satisfactory to know that, notwithstanding all this opposition, a large majority of the Burton Town Council were found to support Alderman Lowe's small measure of justice to the gas consumers.

We have dealt at length with this business, as it illustrates in a peculiarly strong light the tendency of Municipalities to bleed their gas undertakings for the supposed benefit of the ratepayers, instead of making these pampered citizens pay directly for public works which are so often undertaken for the honour and glory of some particular Mayor or other notable. Ratepayers are never satisfied. Here, at Burton, where the big breweries pay half the rates of the town, there is the same whining about the amount of the rating that is heard in places where a penny rate returns about £50 a year. Meanwhile, no less than £95,000 has been voted out of the gas profits in aid of the rates since the undertaking became the milch-cow of the Corporation. Truly, it was expedient that the gas-works should be acquired in the name of the ratepayers! And yet they are not happy. They would like a few Water Companies and a railway or two to keep them in affluence.

The British Association.

THE meeting of the British Association at Toronto is over, and the Association is adjourned to Bristol, some time in 1898. This year's proceedings have been singularly barren of practical interest. This is a remark that would draw down the scorn of scientific men of the stamp of Professor Forsyth, President for the year of the Mathematical and Physical Section of the Association, whose address was largely devoted to supporting the thesis that mathematics is deserving of study for its own sake, regardless of any practical applications. There has always been this disagreement between mathematicians and practical men respecting the objects and intrinsic value of pure mathematical science. Engineers may often feel the want of a more complete mathematical equipment than their education has embraced; but they are compelled to stand aghast at the operations of professed mathematicians, and not seldom dismiss them from consideration as being little else than scientific trifling. We honestly believe that all young engineers should master as much mathematical science as they can acquire during two or three years of their novitiate; but we also regard as wasted the extreme devotion to mathematics which passes on the Continent as necessary to the acquirement of engineering knowledge. After all, this is applied mathematics, which Professor Forsyth would most probably hardly regard as mathematics at all. There are plenty of luxuries, however, which a man with his living to get must be content to do without; and it looks very much as if a taste for pure mathematics were one of them.

The Enemies of Sulphate of Ammonia.

THE discussion upon Mr. Carulla's latest contribution to the rehabilitation of sulphate of ammonia, which was reproduced in last week's "JOURNAL," is replete with interest, but cannot be described as materially advancing the cause. It is satisfactory that Mr. Carulla has given up his somewhat fantastic notion of renaming sulphate of ammonia as a means of recommending the salt to agriculturists presumed to be ignorant of chemical science. The product is sufficiently well known by its proper name; and if cultivators of the soil do not properly appreciate it, in the estimation of producers, there must be some other deterrent at work besides the circumstance that the name does not contain the word nitrogen, nor any of its derivatives. It is not at all unlikely that if producers of sulphate, when next they meet together to talk over their common concern, would procure the presence and counsel of two or three practical agriculturists, they might learn from them something to their advantage. Scientific cultivation of the soil is not by any means so simple a business as it is sometimes made to appear in print. The soil is not a mill, into which whatever weight of raw material is put is bound to come out again somewhere. The cultivator is by no means assured that his well-intentioned efforts to increase the fertility of his fields will answer, no matter by what formula he may proceed. If he were always a rich man, to whom an unsuccessful experiment or two meant little beyond the disappointment, this uncertainty would not be so hampering. As it is, the average cultivator has absolutely no money to sink in doubtful experiments upon the land. Unfortunately for the artificial manure trade, the latest suggestion for restoring the fertility of exhausted soils by the cultivation of those leguminous crops which possess the attribute of absorbing atmospheric nitrogen and giving it up in useful form to the soil, is precisely of a character to attract the impoverished agriculturist. If he has no money, he has time; and time properly spent is all that is necessary, according to the newest light of agricultural science, to render even a barren sand fruitful. True, not much has been heard of late of the remarkable suggestion for increasing the power of soils to fix atmospheric nitrogen, by inoculating the ground with suitable bacteria. This silence may mean anything. Meanwhile, it will do the producers of sulphate of ammonia no harm to bear in mind the reflection that they have other adverse influences to contend with, besides ignorance and apathy of agriculturists and machinations of the nitrate of soda interest.

The Excursion Meeting of the Institution of Gas Engineers.—The excellent programme arranged for this meeting by the President (Mr. Corbet Woodall, M.Inst.C.E.), as pretty fully set forth in our columns a fortnight since, was duly carried out, and has proved in every way an unqualified success. The majority of those who took part in the proceedings left Liverpool Street Station of the Great Eastern Railway on Tuesday evening, and arrived—by the Hook of Holland route—at Amsterdam early the following morning. Here, under the guidance of Mr. H. Salamons, the Engineer in charge of the Imperial Continental Gas Association's works, a visit was paid to the Nieuwer Amstel station—the one that was described by Mr. Salamons in his paper read before the Institution last May. The party were entertained at dinner on Wednesday evening by the Directors of the Imperial Continental Gas Association. A move was made to the Hague on Friday; and the trip continued the next day to Brussels, where Sunday was spent. Yesterday (Monday) was occupied with sight-seeing at Antwerp—the party being entertained at luncheon by Mr. Woodall, at the Hotel St. Antoine—and the return journey was commenced last evening.

Gas and Water Companies' Directories and Statistics.—Messrs. Hazell, Watson, and Viney, Limited, forward copies of their two annual publications—"The Gas and Electric Lighting Companies' Directory and Statistics," and "The Water Companies' Directory and Statistics"—both revised to July 1 last. This is the twenty-first issue of each book; and, besides the usual contents of a directory and book of statistics, alphabetical index lists are given of the chairmen, managers, engineers, and secretaries of the various companies referred to, and lists of the technical associations in all parts of the world dealing with subjects of special interest in the industries involved. As has been noticed on previous occasions when referring to the issue of these and similar publications, everything depends on their strict accuracy if they are to be really useful; and a decision on this point could be more easily arrived at after the lapse of a few months than directly on publication. Any way, the Editor claims that the revision "has this year been of a most exhaustive character;" and, "in consequence, a large number of works not previously dealt with are now included."

Treatise on Modern Gas and Oil Engines.—Under the title of "A Practical Treatise on Modern Gas and Oil Engines," Mr. Frederick Groves, Assistant Lecturer and Demonstrator in Engineering at the Yorkshire College, Leeds, has published (through the medium of the Technical Publishing Company, Limited, of Manchester) a very useful book, in which he has endeavoured to supply to the average mechanical draughtsman the information necessary to enable him to apply his art to the design of gas-engines. In developing the conception of his work, the author first describes the general arrangement of a gas-engine plant; then the types of modern gas-engines; and afterwards he has attempted to explain how their leading dimensions may be calculated. As the importance of systematic testing is now felt by many engineers, he describes in detail the apparatus required, and the calculations necessary, to make a complete gas-engine trial; and, in connection with this subject, a chapter is added on the practical analysis of gases. The first part of the book concludes with a description of a series of experiments made to determine the effects of the products of combustion when present in explosive mixtures of coal gas and air; while in the second part of the book a brief description is given of the physical properties of oils, of oil-engine vaporizers, and a few special points in connection with oil-engine testing.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 645.)

We are getting towards the end of the slack season; and last week was not without signs that the turning point is pretty well reached, so far as most of the principal departments are concerned. But the disposition in the earlier days of the week was rather dull and quiet, though prices kept up well. Continued abundance of money favourably affected the gilt-edged class; and good traffic returns helped Rails. As the week progressed, things grew more active; and there was considerable buying of good class stocks. But by far the most interesting feature of the week was the publication of the Governor of the Bank of England's letter to the Chancellor of the Exchequer on the silver reserve, both the matter and the manner of which are alike deplorable. It is not exceeding the mark to say that this letter has shaken confidence in the wisdom of the Bank Parlour counsels. Happily the publication comes in time to avert the threatened mischief. The Gas Market was very quiet; and, so far from the turning point of the seasonable slackness having been reached in this department, the inactivity was more pronounced than ever. If we exclude the variations in quotation arising from stocks being quoted *ex div.*, there has only been one single change made, and that in an unimportant issue which is rarely dealt in. Transactions throughout the list were extremely restricted; but they sufficed to show that the firmness which has prevailed so long remains still unimpaired. In Gaslights, the "A" showed great steadiness; being done at 319 nearly every day of the week, and the concluding mark being at that figure. The secured issues profited by the demand for superior investments; and a fair number of transactions were effected at very good prices. South Metropolitan again reached top price, but could not get above it. Commercials were a blank. Dealings in the Suburban and Provincial Companies showed strength in Brentfords; and the *ex div.* changes in Brighton and Tottenhams produced a smart advance. The Continentals were quiet and unchanged. Among the rest, Hong Kong had a rise. The Water Companies exhibited their usual extreme quietude. But they all held on very firmly; and one or two slight improvements in quotations were effected.

The daily operations require but a very brief notice. On Monday, only about half-a-dozen transactions were marked; but at good figures. Hong Kong rose ½. Tuesday's business was about on a level with the previous day's, and nothing moved. In Water, Kent rose 1. Wednesday was the busiest day of the week, with good prices all round. Thursday fell very slack again; but firmness was unabated. A little more business was perceptible on Friday; and only a trifle more liveliness was wanted to send quotations up. In Water, New River rose 2. Saturday was dead, and nothing moved.

ELECTRIC LIGHTING MEMORANDA.

The Example of Bradford—The Gratis Supply of Lamps—Advantages of the System—An Appreciation.

Bradford is one of the few towns where municipal electric lighting pays its way; but there are plenty of reasons for this satisfactory state of things. The undertaking has been at work for seven years—being, indeed, the pioneer venture of the kind. The running expenses are very low; and the business is fairly good. Among other distinctions, the Bradford undertaking was the first to try the experiment of increasing the voltage of the low-tension supply from the usual 100 to 200 volts. As a necessary accompaniment to this change, the plan of supplying lamps *gratis* was adopted; and according to a communication made by Mr. A. H. Gibbings, the City Electrical Engineer, to "Lightning," the arrangement has had the unexpected merit of killing several birds with one stone. The original motive for the free grant of lamps was, of course, to prevent consumers objecting to the increased voltage. Their chief interest in the change was concerned with the effect upon the lamps; and if the Corporation gave them new lamps *gratis*, of course they had no objection to receive the gift, and no reason to "look it in the mouth," so to speak. With commendable prudence, however, the Corporation surrounded their donation with certain useful conditions, which were fully set out in the "Electrical Review" for Dec. 4 last. The Corporation were constrained to give the new lamps; but it would never have done to allow the users to think it would be a case of asking and having just as often as they chose.

What the Corporation did in the first place, therefore, was to lay down a basis of reasonable requirement as regards renewals. This was taken at 3½ watts per candle power for consumption, and 1000 hours for the life of the lamp. This is a pretty high standard, both of efficiency and durability; but at any rate it gave a figure to work upon. Next, a condition was made that accounts must be paid within two months of their becoming due, or else the consumer would forfeit his right to new lamps for the half year. The effect of the latter requirement has been to greatly encourage the prompt settlement of accounts—a notable illustration of the close connection between sound electrical engineering and satisfactory finance. Again, as the Corporation do not hold themselves bound to supply new consumers with their first outfit of lamps, these have to be furnished by the local wiring contractors. The consumers have learnt to stipulate that the lamps thus supplied in the first instance shall be of the same make and design as those usually given by the Corporation. Hence the local wiring firms have found it is practically useless to deal in cheap and inferior lamps; and thus the influx of low-priced and inefficient foreign goods is indirectly but almost entirely prevented. Mr. Gibbings confesses that he did not anticipate this result "when he first put his uniform (lamps) on;" but it is gratifying, all the same.

A third incidental advantage has accrued from the circumstance that, always having spare lamps in hand, consumers have at once utilized them to replace lights which had been allowed to fall into disuse. "This oversight in not replacing lamps which are burnt out, is characteristic of a considerable proportion of consumers, as may be seen in any town; and the fact is probably accounted for by the expense incurred in keeping a stock of lamps in hand." This point of detail is of considerable interest. Everybody knows that where lamps need chimneys, or mantles, or any other removable appurtenance, there come times when the store of such articles runs out, and then the light has to be done without. It can be easily imagined that, in the case of incandescent electric lighting, the lack of lamps to replace broken ones may become chronic with some careless consumers, leading to an enforced economy of current which would be regarded as undesirable by the supplying authority. It is wonderful how these little matters mount up in the course of the year; and Mr. Gibbings is to be complimented upon the solicitude which he displays for these unconsidered trifles of the electric lighting business. It is an example which dealers in other means of lighting will do well to emulate in their own way. Another advantage recited by Mr. Gibbings consists in the greater equality of lighting effect enjoyed by lamp-users. "It was no uncommon thing in time past," he remarks, "to see two different installations side by side, one of which, having comparatively new lamps, rejoiced in a correspondingly good light, while the other, whose lamps had seen better days, glimmered with light that could hardly be dignified with the title. This was a frequent cause of complaint; and needless to say, the true explanation was not always accepted by the consumer as gospel." All these collateral and direct advantages of the system of supplying lamps *gratis* amount to a good deal, taken together; and both the Corporation and the users of Bradford electricity have reason to be satisfied with the new policy—which, by the way, has hardly been in force a year. The system is very simply worked. The consumer, having paid his account for current, exhibits the receipt to the storekeeper at the Corporation works, and obtains the number of lamps to which he is entitled, for which he signs the lamp-book. He is entirely responsible for them after they have been handed to him, and can do with them what he pleases. No old lamps are asked for in exchange; and the new ones are substituted for the old or not, entirely at the consumer's discretion. The accounts show the number of units consumed for incandescent lighting, which are charged at the uniform rate of 5d. per unit; and the storekeeper has a simple division sum to do, taking the number of watts corresponding to the candle power of the lamp (60 watts for a 16-candle power lamp, &c.) into the total consumption.

We have devoted some space to the explanation of this Bradford system, because we regard it as one of the happiest conceptions yet brought forward for increasing the popularity of electric lighting. It is likely to be far more helpful in this direction than any amount of dodging about the rate of charge. The incandescent electric lamp is essentially a thing for the supplier of current to look after, not the consumer. Mr. Gibbings seems to imply that the system in force at Bradford answers the purpose of keeping the consumers well stocked with lamps, so that they do not need to purchase any to make good breakages. This assumption appears only tenable when taken in conjunction with the fact of the consumers having been started quite recently with a complete set of new lamps. As time goes on, unless the make of high-voltage lamps improves, the proportion of renewals must rise. There are doubtless as good 200-volt lamps as any at 100 volts, but not so many of them in a parcel. Any allowance required to compensate for this change of the circumstances would not, however, be serious. Anyhow, the Corporation of Bradford are on the right track.

An Issue of Debenture Stock by The Gaslight and Coke Company is announced. There will, in all, be sold by tender £50,000 of 6 per cent. perpetual debentures; and the minimum price reserved by the Board is £212 10s. Further particulars appear in another column to-day.

The Debenture Stock of the South Metropolitan Gas Company.—In response to the statutory advertisement (a copy of which appeared in our pages), all the 3 per cent. debenture stock—£43,333 in all—recently offered for subscription by the Board of the South Metropolitan Gas Company has been taken up. Tenders at 105½ and upwards receive allotments in full; those at 105¼ get nearly 25 per cent. of the amount tendered for; while those below this latter price get nothing.

THE CONGRESS ON TECHNICAL EDUCATION.

[Second Article.]

An interesting paper was read by Sir Philip Magnus on "Theory and Practice in Trade Teaching," which raised the question of the different methods of imparting instruction in the technology of trades in vogue in various countries. Our own Technical Instruction Act expressly forbids the teaching of the practice of a trade in any technical school; whereas in France and Austria, and in some other countries, there exist what are called Apprenticeship Schools. Local authorities in England, while desiring to adhere to the principle that trades are best learnt by actual practice in the factory or shop, are often constrained to approximate their technical classes so closely to the teaching of a trade, that the Government has been obliged to give a very broad and liberal interpretation to the Act. The idea of technical instruction is, of course, the instilling of principles or the theory that underlies trades; and this is the idea which the City and Guilds of London Institute has been trying during the last seventeen years to carry out. But the consideration that such instruction, to be of any use at all, must have regard to the commercial standard of what is acceptable, brings the school and the shop closely together. There is in many—perhaps the majority—of handicrafts plenty of room for the school to supplement the shop. The former is required to impart that knowledge of the why and the wherefore of trade processes which the apprentice would be a long time picking up in a shop, though he might be gaining in his ordinary work the skill and habitude of practising his craft which theoretical knowledge could never convey. "It will be seen, therefore, that, although a technical school may be equipped almost as completely as a trade shop, the equipment serves a very different purpose. Its object is the production of intelligent workpeople, and not the production of saleable commodities." The difficulty of technical schools is that the proper equipment is expensive, the exact kind of science best adapted to the requirements of workmen employed in definite trades not easy to decide upon, and satisfactory teachers rarely to be obtained.

The last question—the "Training of Technical Teachers"—was the subject of a paper by Mr. Sidney H. Wells, himself a Whitworth Scholar and Principal of the Battersea Polytechnic. The ideal technical teacher is a man who actually works at his trade, understands it, and possesses the faculty of imparting his special knowledge to others. The combination is rare. Mr. Wells hopes to procure a supply of qualified teachers by a system of trade scholarships open to actual tradesmen, who are to be encouraged to train themselves in practical science and methods of teaching at the Battersea Polytechnic.

Professor Ayrton described the work of the City and Guilds of London Central Technical College; and in the course of his remarks took the opportunity of denouncing the unfortunate premium pupil system that has grown up in the engineering profession. He said he had feared the existence of this system would be a bar to the obtaining of employment by students trained at the Institute; but these fears have turned out to be groundless. "Every intelligent student who goes through our complete diploma course secures a berth within a comparatively short time. Indeed I may say even more than that. It has come about during the last two or three years that students are offered salaried posts before the completion of their College course, and before, therefore, they are able to leave the Colleges to take up the duties which they are engaged to carry out." This speaks well for the College; and it should not be overlooked that the College fees are low, and so many scholarships are attached to to the Institution that it practically opens a free course to capable students.

There was a long and valuable discussion upon these papers. Professor Silvanus Thompson alluded to the difficulty of getting trade students to go outside what they considered to be their immediate requirements. "A plumbing student, for example, could not be got, as a general rule, to attend classes on geometrical drawing, taught by a drawing master; and for this simple reason—that the teachers taught geometrical drawing, not of the plumbing, but of scores of different trades, and did not understand one of those trades, or why the plumber wanted to know geometrical drawing at all. . . . The engineering fitter, the carpenter, the plumber, the metal worker, the cabinet maker—all these needed a knowledge of drawing, and yet it would be absolutely useless to put all these men together in one class, under one teacher, because the teacher would not know what to draw." Professor Chatterton, as one of the earlier students at the Finsbury Technical College, and subsequently at the Central Technical College, South Kensington, testified to the excellence of the training which the students received at these institutions. "He was happy to say that he was fairly well acquainted with the career of all his fellow-students, and it was a fact, which he could vouch for, that they were all doing very well, though engaged in the more varied branches of technical work." Professor J. Viriamu Jones testified to the same effect; speaking highly of the energy with which the students of the Central College threw themselves into their studies and investigations. Mr. J. H. Reynolds, the Director of the Municipal Technical School, Manchester, urged the need of co-ordination among the teaching institutions. He also had something to say about the educational wants of the plumber, who pervaded the whole discussion. It is Mr. Reynolds's opinion that the plumber will not learn much science or art from any teacher who is not also a plumber, or who knows what kind of science and art underlie or can be applied to the business of plumbing. The same with the carpenter or the engineer. Mr. Reynolds laid great stress on the need of workmen of sound general schooling, without which it is impossible for them to derive the full benefit of technical instruction. A mournful interest attaches to the observations offered on the same subject by the late Mr. Mundella, who endorsed what Mr. Reynolds had said as to the low standard of elementary education in this country.

Those who desire information concerning foreign technical schools and engineering colleges will find much first-hand description and testimony respecting this subject in the proceedings of the conference. Mr. William Woodall, M.P., spoke upon the systems of certain small Continental States. He reminded the Congress that what the delegates ought to specially discuss was not the education of the workman, but the highest kind of technical instruction as adapted to the training of the future captains of industry. Mr. Woodall testified to the valuable work that is being done in this respect by Wurtemburg. There was a curious echo of a striking portion of Mr. Corbet Woodall's Institution address in the references of his elder brother to the teaching of electricity in Stuttgart and its fruits. Speaking of his own official visit the previous year to the Stuttgart Exhibition, Mr. W. Woodall said it was impossible "not to be overwhelmed with the evidence of the profitable results that had accrued from the large and generous expenditure on education, from the elementary to the highest." The speaker also mentioned again the example of the lost British coal-tar colour industry, which originated in England; and he declared that "what had been done in so many departments in the application of chemistry to profitable manufactures was now being pursued with remarkable success in regard to the application of electricity. It was surely abundantly clear to them that it was only by the provision of the very highest facilities in technical and scientific instruction that we in England might hope to rival—he was afraid that he could not conceive it possible that we could excel—the remarkable success that had attended such enterprises in Germany." Mr. Snape, of Liverpool, observed that no parliamentary candidate for any of the Lancashire constituencies south of Preston could hope to be returned if he favoured the extension of the school age; but Mr. Mundella declared his intention of introducing a Bill into Parliament to abolish the "half-timer" system altogether.

Sir Joshua Fitch read a thoughtful paper on "Some Limitations to Technical Instruction," in which he urged the importance of studying all kinds of instruction in the proper perspective. "We are all agreed that our schools have been for centuries too much absorbed in bookwork, in verbal studies which sought to train memory and reasoning only, but which failed altogether to give adequate discipline for the eye and the hand, or to fit the scholar for skilled labour and for practical life." Yet the speaker declined to advocate the too early teaching of the science connected with a skilled trade. "Still less does it seem to me well to encourage the desire on the part of the young student to accumulate certificates in a certain number of sciences—chemistry, electricity, sound, light and heat, and so forth." A thorough grounding in elementary school subjects is the first necessity of the technical student; and Sir J. Fitch warmly advocated the provision in our school system of the "leaving certificate," which is in operation in France and Germany, and shows that the primary school course has been creditably passed through. Nothing struck Sir J. Fitch more in visiting the Continental trade schools than the constant insistence on the pursuit of some of the humanizing or formative studies, concurrently with the special studies bearing on trade and industry. One-half of the day is given to the "humanities," and the remainder to specialism; and it is found that technical instruction fails of its own purpose unless accompanied by general culture. This is a lesson of enormous importance. The speaker referred to the experience of Socrates, who went among the artisans in search of knowledge which the philosophers did not possess. He observed that the workmen could indeed produce many useful and ingenious things; but he was disappointed with their intellectual condition—"their bounded horizons, their incapacity for reasoning, their disdain of other knowledge than their own, and the lack among them of any general mental cultivation or of any strong love of truth for its own sake." If Socrates were to return to earth to-day, would he not find the same failing in our politically emancipated working class? Sir J. Fitch finds the educational value of mere handiwork "very limited." He entirely admits, as an old Inspector of Schools and Training Colleges, that our school instruction has long been too bookish and too little practical. He also concedes that, apart from the industrial and economic results of better manual instruction, there may be in such instruction a high educational purpose—"that it may tell on character, awaken dormant faculty, teach the better use of the senses, and increase the power of the human interest over matter and over the difficulties of life. Only do not let us exaggerate the educational value of manual instruction, or suppose that all our difficulties are to be solved by turning our schools into workshops." There are two ways in which our educational system may be improved: "First, by

aiming at a higher standard of general intellectual culture in the schools from which technical schools are recruited, and thus securing a more solid groundwork for our special instruction. The second expedient is to urge, whenever possible, upon each of the young people in our trade and evening classes to take up one subject at least—it may be history, or mathematics, or philosophy, or a foreign language—which has no direct or visible relation to his trade, or to the means whereby he hopes to get a living, but is simply chosen because he likes it, because his own character is enriched and strengthened by it, because it helps to give him a wider outlook upon the world of Nature, of books, and of men, and because he may thus prepare himself better for the duties of a citizen and a parent, as well as for an honoured place in the ranks of industry."

PERSONAL.

Mr. DAVID EASSON, Assistant Manager at the Perth Corporation Gas-Works, has been appointed Manager to the Maybole Gas Company.

Mr. W. G. OWENS, of Ross, has been appointed Manager of the Aberavon Corporation Gas-Works, in succession to Mr. G. W. Harrison, who resigned the position owing to continued ill-health.

The Limerick Corporation have appointed one of their own number—Alderman P. O'RIORDAN—to succeed the late Mr. W. Spillane as Manager of the gas-works. The commencing salary is £300.

An interesting ceremony took place in Helensburgh last Tuesday. Mr. WILLIAM SMITH, the Manager of the Helensburgh Gas Company, in July last completed the period of fifty years' service with the Company, in the management of which he also succeeded his father; and occasion was taken of this almost unique fact to present him with a silver salver and a purse of one hundred sovereigns, as a token of the appreciation and esteem in which he is held by his brethren and his fellow townsmen. Provost Anderson, of Helensburgh, presided, and made the presentation. He spoke highly of the zeal and fidelity displayed by Mr. Smith in the prosecution of his duties during the long period of 50 years that he had been Manager. Ex-Provost Breingan, of Helensburgh, who is Chairman of the Gas Company, also spoke of the good service which Mr. Smith had rendered to the Company. Mr. Smith suitably returned thanks for the gifts, and gave an interesting account of the history of the concern.

OBITUARY.

The death is announced of Mr. SAMUEL WARD, the Manager of the Bute Docks Gas-Works, East Moors, near Cardiff.

Mr. ZACHARY MELLOR, the Town Clerk of Rochdale, died somewhat suddenly on Monday morning last week. Deceased was 78 years of age. He had been in failing health for some years, and had not latterly been required to perform active duties, but was occasionally consulted on important matters. Mr. Mellor, who was a native of Rochdale, and a solicitor, was appointed Town Clerk in 1856, on the incorporation of the borough.

The death, from lockjaw, is announced of Mr. ISAAC FORD, Manager of the Rotherham Main Colliery of Messrs. John Brown and Co., Limited. An injury to his thumb, caused through a fall on the pit bank, from which nothing serious was feared at the time, has had this sad issue. Mr. Ford, who was a native of Rawmarsh, was formerly Manager at the Aldwarke Main Colliery, removing to Canklow when the more important undertaking of the Company was projected. He was only 45 years of age.

The death occurred, on Monday last week, of Mr. HERBERT BRAMLEY, Town Clerk of Sheffield, while in Brussels on his return journey from his autumn holiday in Germany. Mr. Bramley only held his last position since Oct. 9, 1895, when he succeeded Mr. J. W. Pye-Smith. During his all too brief official life, however (as is remarked in an appreciative memoir published in the "Sheffield Independent"), Mr. Bramley certainly won fame by the skilful and successful way in which he carried through Parliament the Bills authorizing the great water scheme which is now being carried out in the Langsett Valley. This business was as vast in its dimensions as it was complicated in its details. Nothing delighted Mr. Bramley more than to spend his time unravelling legal complications; and the work of the office, in almost every branch of it, afforded him real pleasure. The work that fell upon his shoulders in connection with these Water Bills was simply colossal.

The Accounts of the Metropolitan Water Companies for 1896 were last Thursday issued as a Parliamentary Paper, as a return to an order of the House of Commons dated May 5.

A Society for the Promotion of Acetylene and Calcium Carbide Interests has just been organized at Düsseldorf, under the title of the Verein zur Wahrnehmung der Gemeinsam Interessen der Calciumcarbid und Acetylen Gas Industrie.

NOTES.

The Coal Resources of Great Britain.

Professor Hull has published a fresh estimate of the extent of the coal resources of the United Kingdom at the end of the century. In this estimate of the different coal-fields of Great Britain, the figures of the Royal Commission have been adopted, with modifications. After making all allowances and corrections deemed to be necessary, the total estimated quantity of coal within a depth of 4000 feet remaining at the close of the century is found to be 81,683 million tons; the quantity remaining in the visible coal-fields of Great Britain and in partially concealed areas being nearly 58,276 million tons, that in the entirely concealed areas 23,253 million tons, and that in Ireland upwards of 155 million tons. Unfortunately, the Irish coal-fields are of only local importance. With regard to coal south of the Thames, Professor Hull takes a hopeful view of the future of the Kent coal-field. It may now, he says, be accepted as geologically certain that between Dover and Bath there occurs a more or less interrupted trough of coal measures 150 miles in length and of breadth varying from two to four miles. He divides the various English coal-fields into three classes—progressive, stationary, and retrogressive. The last category indicates approaching exhaustion. Among the progressive districts are included South Wales and Monmouthshire, the North Midland, Scottish, Lancashire and Cheshire, Great Northern, Denbighshire, Warwickshire, Cumberland (slightly), Leicestershire (slightly). The stationary coal areas are Bristol and Somersetshire, and the Forest of Dean. The retrogressive areas are South Staffordshire, Flintshire, and Coalbrookdale. Altogether Professor Hull's views of the prospects of the British coal industry are optimistic.

Energy and Matter.

Professor William Ramsay appears to be much exercised in regard to the connection between energy and matter. He refers to Professor Ostwald for a classification of some of the forms of energy, which are all expressible as the product of two factors, one of which has been termed the "intensity factor," and the other "capacity factor." These are given in the last edition of the "Allgemeine Chemie," and may be summarized as follows:—

Kinetic energy is the product of mass into the square of velocity.			
Linear	,,	,,	length into force.
Surface	,,	,,	surface into surface tension.
Volume	,,	,,	volume into pressure.
Heat	,,	,,	heat capacity (entropy) into temperature.
Electrical	,,	,,	electric capacity into potential.
Chemical	,,	,,	atomic weight into affinity.

That is to say, in all questions of energy, considerations analogous to the familiar terms pressure and quantity enter equally. Such considerations draw attention to the fact that, even in measuring quantities of matter, weight need not be everything. Because we follow the convention of measuring quantity of matter by its mass, the word "mass" has come to denote "quantity of matter." But it is open to anybody to measure a quantity of matter by any other of its energy factors. It is possible to state that those quantities of matter which possess equal capacities for heat are equal; or that equal quantities of atoms represent equal quantities of matter. "Indeed, we regard the value of material as due rather to what it can do than to its mass; and we buy food, in the main, on an atomic, or perhaps a molecular, basis, according to its content of albumen. Most articles depend for their value on the amount of food required by the producer or the manufacturer."

Preservative Paints for Ironwork.

Mr. Max Toltz, an American engineer, has gone comprehensively into the question of paint as a preservative of structural iron and steel. He had a number of sheet-iron trays made of one size, 12 inches in diameter by ½ inch deep. The skin of the iron was carefully removed, and two trays were painted with every kind of paint tested—one receiving one coat, the other two coats, with an interval of a week between. After the paint was thoroughly dry, the trays were filled with water which was allowed to evaporate at the temperature of the room in which the specimens were kept. When a tray dried, water was poured in again, and so on until more or less rust appeared on the trays. This test was admittedly severe; but in Mr. Toltz's opinion no paint that fails under it is admissible for exposed iron or steel structures. As a result of his experiments, Mr. Toltz has settled upon the following scheme of protection for such structures. First, the pieces should have a coat of the best refined linseed oil and lamp-black at the mill; the scale being previously cleaned off. After erection, there should be applied by skilled painters a rather thick coat of real asphaltic varnish paint, or a paint composed of carbon black and a varnish body; the work having first been thoroughly scraped clean and dry. Another coat of paint should be applied not sooner than ten days after the first. No turpentine, benzine, japan, or driers should, under any circumstances, be allowed in this second coat. These two coats will be sufficient for the bulk of the structure; but any parts exposed to steam or gases should have a third coat, which might be of oxide paint.

The Transmission of Light.

According to reports, an experiment has recently been made "in America" by Francke L. Woodward, which, if confirmed, will reverse all the accepted ideas of the method of transmitting

light through space. This experiment seems to indicate that light in its known form cannot be transmitted through a vacuum. An exhausted glass bulb was covered with black paper in which three round holes were cut—two at opposite ends of a diameter, and the third at one end of a diameter at right angles to the first. A beam of limelight was sent across the vacuum bulb through the first two openings. On viewing the interior of the bulb through the third hole, it was almost impossible to see the beam in its course. The intensity of the light issuing from the bulb was not one-twentieth of that which entered it; and the higher the vacuum the less the light that passed. When, however, a powerfully-excited Crookes tube was focussed upon the bulb, the emergent beam had almost the same intensity as the entrant rays. Woodward regards this result as supporting the theory that the Röntgen rays consist of a stream of solid particles capable of passing through the glass sides of the bulb, which facilitate the transmission of ordinary light. It would follow from this that the presence of material particles as well as of ether is necessary for the transmission of light through space; and the absence of such particles in cosmic space would need to be compensated for by the presence of a cathode stream from the sun. Hitherto the assumption has been that light as we know it leaves the sun and traverses space in precisely the same form; but this is not necessary. On the other hand, if a vacuum is really a bar to the transmission of light, how does an ordinary incandescent electric lamp work?

The New Redheugh Bridge over the Tyne.

A description has been published in the "Engineer" of the new Redheugh Bridge over the Tyne, between Newcastle and Gateshead, which is being built under provisions of a Special Act of Parliament by Messrs. Sir William Arrol and Co., to the designs of Messrs. Sandemann and Moncrieff. The old Redheugh Bridge has only been opened 26 years; but it had become too narrow for its work, and was, moreover, suspected of structural weakness. The Newcastle and Gateshead Gas Company were interested in the structure, to the cost of which they contributed, as they are authorized to do in regard to the new structure. The extraordinary feature of the bridge, remarked by our contemporary, is that "the upper and lower members of the girders are respectively gas and water mains." This peculiarity is not to be repeated in the new bridge, which is to carry gas and water mains of the ordinary kind upon its superstructure. Careful provision has been made for the proper carrying out of this work. Inasmuch as the new bridge is to occupy the same line as the old, the change will involve some troublesome adjustments. Everything has to be carried out practically without stopping the foot passenger traffic. By the Bridge Act, the contractors are bound not to break the flow of water in the water-mains, nor of gas in the gas-main, for more than three days of 24 hours; each of these days being at least three weeks from the other preceding or following.

Rendering Wood Non-Flammable.

The problem of rendering wood non-flammable is one of long standing. One of the latest attempts at solving it successfully was described by Mr. Charles E. Ellis at the recent International Congress of Naval Architects. It consists in exposing the timber in a vacuum chamber, to which steam is afterwards admitted. Then a vacuum is again formed, and a solution of salts is sprayed into the chamber with steam until the wood is thoroughly saturated. It is then dried, and is ready for use. It is claimed that the salts with which the wood is thus impregnated retard the rapid carbonization of the wood under high heat, which is generally observed, and prevent the generation of inflammable gases. A test made under the auspices of the Office of Works has illustrated the practical impossibility of setting fire to a shed built of the treated wood, even though saturated with petroleum. The question of the reliability of wood so treated, as regards resistance to fire over a long period of time, is of vast importance, particularly in connection with the transport and storage of coal in wooden ships and stores, and the employment of timber in factories. Experience shows that test experiments with temporary wooden structures do not throw any light upon the condition of timber maintained for a long period in dry and warm situations, and in contact with coal and other substances liable to spontaneous ignition.

North of England Gas Managers' Association.—The programme issued by the Hon. Secretary (Mr. J. H. Penney, of South Shields) for the forty-first half-yearly meeting of the Association, at Scarborough, on the 2nd prox., promises an interesting and instructive gathering. The meeting will be held in the Grand Hotel, at 12 o'clock, when his Worship the Mayor of Scarborough (Mr. R A. Marillier) and the Chairman of the Gas Company (Mr. Benjamin Fowler, J.P.) will offer a welcome to the members. An address will be delivered by the President, Mr. J. Holliday; and afterwards a paper will be read by Mr. Dunn, of Selby, entitled "Automatic Regulation of the Speed of Exhausters." Lastly, on the invitation of the President, the Association will dine at the Grand Hotel in the afternoon. The Directors of the Scarborough Cliff Bridge Company are courteously arranging to allow members and associates to be admitted free to the Spa and grounds; and the Scarborough Gas-Works and the new gasholder station in the Seamer Road will be open for inspection during the visit of the Association.

COMMUNICATED ARTICLE.

SOME PRACTICAL OBSERVATIONS ON GAS MANUFACTURE.

By S. Carpenter, of East Ham, Essex.

In submitting the following observations for publication in the "Journal," it should be explained that they have not been written for managers of gas undertakings who have had the advantage of a thorough training in their profession, but are intended to serve, in a modest way, as a guide to those who have attained responsible positions in gas-works by virtue of natural ability rather than of liberal education. The writer offers them in the hope that they may be of service to those who peruse them.

The Production and Purification of Gas.

In the carbonization of coal for the production of gas, the retorts should be at a bright red heat, before the coal is put in. When it has been deposited, and the lid of the retort closed, the heat causes the coal to intermesce, and liberate the volatile matter, which passes up the ascension-pipe into the hydraulic main. The gas and the tar should be allowed to flow to the condenser before being separated, as on reaching it they will separate themselves—the tar being deposited, and the gas going on to the purifying apparatus. The liberation of the volatile matter in the coal sets free the different impurities it contains. These present themselves in various states of combination. Sulphuretted hydrogen shows itself in two forms—one being found in the crude gas, and the other in the ammoniacal liquor. Hydrogen appears in several forms and under various conditions. It combines with different ingredients to produce certain hydrocarbons, such as gas, naphtha, &c.; with sulphur, to form sulphuretted hydrogen; and with nitrogen, to form ammonia. Carbon combines with oxygen to form carbonic oxide and carbonic acid, and with sulphur to form bisulphide of carbon.

Crude gas, as is well known, is an unpurified vapour or smoke. At the arch-pipes, before it passes through the tar in the hydraulic main, it can be plainly seen; but at the outlets of the main end of the condensers, it is not perceptible. The condensers perform a very important part in the purification of coal gas. The gas and tar together, on issuing from the outlet of the hydraulic main, should be conveyed a distance of some 300 or 400 feet before they enter the condensers. Those formed of a series of vertical pipes, so that the process of cooling the gas may be carried on above ground, are very good. This method will avoid any sudden condensing of the gas, and prevent stoppages. By keeping the tar for a long time in contact with the gas, it will be enabled to do its work as a purifying agent. It may, perhaps, cause a little surprise that the writer should call tar a purifying agent. Tar consists not only of several components of a fluid kind, as usually represented, but contains also a portion of solid carbon or soot which has been prevented from undergoing mechanical admixture with the gas by the peculiar attractive and condensing power of the various hydrocarbon compounds; and the fact that when the crude gas has passed through the hydraulic main it is found to have lost its smoky colour, proves very clearly that it is the tar in the main that has removed it.

If the gas has been properly cooled in the condensers, and the tar separated before it reaches the scrubbers, the gas should be well washed with ammoniacal liquor and fresh water. This is indispensable to its perfect purification. If the gas is not properly condensed, and as much as possible of the tar removed from it, and the temperature of the gas at the outlet of the condensers is about 80° Fahr. in summer, the absorbent power of the water passing into the scrubbers will be very much diminished; or if the tarry matter is carried forward in large quantity into the scrubbers, the bottoms will, in course of time, become stopped up to a degree that will seriously affect the purifying action of the apparatus. To prevent, to a certain extent, the tar from passing into the scrubbers, if there is not a washer on the works, the gas should be first sent into a large tank, where much of the tar will be deposited; and if the scrubbers are kept in good working condition, they will take out the ammonia, and a large portion of the sulphuretted hydrogen as well. They are also capable of removing much of the carbonic acid—a very important part of the work they perform in ridding the gas of some of the impurities already mentioned. For example, supposing the crude gas at the inlet of the scrubber contained 2·8 per cent. of carbonic acid gas and 1·3 per cent. of sulphuretted hydrogen, if it is well scrubbed it will at the outlet contain only 1·6 per cent. of the former and 0·5 per cent. of the latter, as shown by the eudiometer tube. The portion of carbonic acid that is not taken out by the scrubbers, of course, passes on to the lime purifiers, its admission into which is, of all the ingredients, most detrimental to the chemical action of the lime on the crude gas, as it converts that material into carbonate of lime, which has no effect on the bisulphide of carbon in the gas. With regard to the choice of condensers, the writer, in practice, has found vertical condensers very good; for the reason that, as the gas passes up and down the pipes, the tar is gradually separated from it. He is strongly of opinion that the particles of tar, as they fall down the pipes, mix with

the ascending gas, and take out and retain a portion of its bisulphide of carbon.

Good condensation is the first step to good purification. The second step is to well scrub the gas. From the outlet of the exhausters the gas is passed into the inlet of the scrubbers, where the ammonia is washed out by water. The writer prefers the kind known as "tower" scrubbers, for the reason that the gas enters at the bottom of the vessel and in rising is met by water falling from the top like rain. The stream of gas in ascending is parted, so to speak, by a series of intervening wood grids or broken bricks, so as to present it in a finely-divided state to the down-pouring water. If the temperature of the gas entering the scrubbers is about 70° Fahr., and that of the fresh water about 60°, the water is capable of absorbing about 780 times its own volume of ammonia, fully 2¼ times its volume of sulphuretted hydrogen, and about 1 volume of carbonic acid. The writer is speaking from practical experience with tower scrubbers, where fresh water and ammoniacal liquor are used. The third step in the purification of gas is its treatment by lime in the lime purifiers. Two of these will be sufficient for the removal of the carbonic acid and a portion of the bisulphide of carbon. Of course, the size of the purifiers will vary according to the make of gas. The first purifier will decarbonate the gas, and at the same time remove a portion of the bisulphide of carbon. The second purifier will contain the hydrogenated sulphide of calcium; and this will take out the rest of the bisulphide of carbon.* The fourth step in the purification process is to pass the gas on leaving the lime purifiers, through boxes containing oxide of iron, to take out the sulphuretted hydrogen; a little atmospheric air being admitted with the gas. If the purifiers are worked in the manner described, gas will be purified in the way best known at the present time. The writer has followed this method for thirty years, and has obtained good results in removing the bisulphide of carbon from the gas.

The Manipulation of Lime.

The best way to manipulate lime for coal gas purification and the ventilation of the purifier, and at the same time effect the revivification of the foul lime therein, so that it may be used a second time, and abate the nuisance created each time the purifier is emptied, is to proceed as follows: First make a connection at the bottom of the side of the purifier, just below the lowest layer of lime, and then bring it into communication with the inlet of a steam-jet exhauster, the outlet of which should be connected to a small purifier charged with oxide of iron. This is for the purification of the air being drawn through the foul lime purifier, as it is at first heavily charged with sulphuretted hydrogen. There should be two pressure-gauges on the exhauster—one on the inlet, showing the vacuum thereon, and the other on the outlet showing the pressure there. When the first lime purifier has done its work, and is thrown out of action, draw the plug in the cover, and let the vessel rest for an hour. Then start the exhauster. After it has been at work about six hours, raise the cover of the purifier. Before this is done, 3-10ths vacuum will be sufficient. If there is too great a vacuum at first, it will raise the temperature of the lime, and there will be danger of firing the grids—a very serious consequence. After the exhauster has been running from four to six hours, lift the cover of the purifier and raise the vacuum to 8-10ths. Continue to ventilate for 18 hours longer. If the cover of the purifier is raised before the exhauster is started, a great nuisance will be caused; but by ventilating the purifier as described, this will be prevented.

When the purifier is out of action, the foul lime in it contains carbonic acid, sulphuretted hydrogen, and bisulphide of carbon. By drawing air through, its temperature is raised to about 200° Fahr.; and this causes decomposition of the impurities. The writer tested air that had been drawn through foul lime, and found in it, at the outlet of the exhauster, carbonic acid and sulphuretted hydrogen; but after the exhauster had been at work about eight or ten hours, there were no noticeable impurities given off. It appears that, on raising the temperature of the foul lime, chemical action takes place between the air and the lime; and the bisulphide of carbon in the lime is thereby decomposed. After the lime has been revivified, we get in the purifier sulphide of calcium instead of foul lime. When taken out, this should be well spread and exposed to the air for a day or two—a little water being added if needed. It should afterwards be well mixed; and then it will be ready for the purifier. On being used again, it should be put into the purifier in the same way as clean lime. When the purifier is charged with sulphide of calcium, it acts much more quickly on the crude gas than does the clean lime, which has no affinity for bisulphide of carbon; but when the clean lime becomes saturated with sulphuretted hydrogen, it begins to take this impurity out of the gas. The writer has found by practical experience that, if pure sulphide of calcium is put into a purifier, and clean gas is turned into it, there is little or no chemical action between the two; but if crude gas is sent into the purifier, chemical action is at once set up.

Lime is a very delicate thing to handle without causing injury or damage to it for the purification of gas. Great care must be taken in preparing lime for the removal of the bisulphide of carbon from the gas. It must neither be too wet nor too dry. It must not be screened, as this would make it too fine, which would cause extra pressure. If there are any lumps, they should not be any larger than ordinary pieces of loaf sugar. If the lime is too lumpy, the gas will pass through it too quickly, and then the bisulphide of carbon will not be sufficiently removed. The best way of preparing lime, after it has been properly watered, for taking out of gas the sulphur it contains in other forms than sulphuretted hydrogen, is to well mix it, and break the lumps with a shovel when turning it over. Care should be taken not to allow any air to mix with the lime while it is being employed for purification, as it interferes with the chemical action already referred to. This action is a very simple one; being merely the neutralization of the bisulphide of carbon in the gas by the alkali sulphide of calcium. Sulphur is of an acid nature, while lime is an alkali in its nature which has great affinity for the acidity of the bisulphide of carbon—in fact, there is a chemical action going on between the lime and the crude gas when they meet in the purifier which has not yet been satisfactorily explained.

The writer has tried his utmost to solve the mystery above alluded to; but he has not been able to do so. All he has been able to do is this: When the lime in the purifier has been in its best working condition, he has had the cover lifted, and then tried the temperature of the lime. But it was impossible to get it with the thermometer, as it fell so quickly when the cover was up. The only thing he could do was to thrust his hand into the lime. He found he could just bear the heat; and the nearest temperature he could judge was from 170° to 180° Fahr. It would, however, be more than this when the cover was down and the purifier at work. Here we find the temperature of the lime is raised by the crude gas; and when this is allowed to act in the presence of the lime, it is converted into hydrogenated sulphide of calcium. Then the chemical action between the gas and the lime commences, and a portion of the bisulphide of carbon is removed from the gas; and the newly-formed compound—the hydrogenated sulphide of calcium—has the power, in a high degree, of absorbing that stubborn impurity bisulphide of carbon.

Lime is a very useful material in the purification of coal gas, for the reason that it will remove the three principal impurities, whereas oxide of iron is not so serviceable as it will only remove one—viz., sulphuretted hydrogen. As oxide of iron is not of an alkaline, but rather of an acid nature, it has no affinity for bisulphide of carbon. With lime, as already explained, it is quite different. Its use, however, is attended with great disadvantages—first, on account of its expense; and, secondly, because of the great nuisance arising from the evolution of the sulphuretted hydrogen during and after the emptying of the purifier. This, however, can be prevented by revivifying the foul lime before its removal from the boxes, so that it can be used a second time. This will reduce the cost of purification. In the first place, less clean lime will be required; and, secondly, there will not be so much spent lime to be sent away. If purification is carried on in the manner here described, it can be done for about 0·6d. per 1000 cubic feet of gas.

The writer would impress upon young gas managers, if they want to keep the bisulphide of carbon down to about 12 or 14 grains per 100 cubic feet of gas, and not to have any trouble with their lime purifiers, never to allow atmospheric air or oxygen to pass into these vessels while they are in action, and the purification process will go on properly. It is indispensable that all the carbonic acid should be taken out of the gas before it enters the second lime purifier. But all the sulphuretted hydrogen should not be removed; enough should be left in to keep the lime in a state of hydrogenated sulphide of calcium, to remove the bisulphide of carbon. There should be two test-cocks on each purifier, where the gas should be tested for carbonic acid, sulphuretted hydrogen, and bisulphide of carbon. The gas should be tested for the last-named impurity on the top of each purifier once a day.

The combination of the bisulphide of carbon with the sulphide of calcium is slower and more gradual than that of the other impurities with the several agents used to absorb them; consequently, to effect a corresponding degree of purification, the gas requires to be kept in contact with the purifying material for a longer time. What the writer did to get over this difficulty was to have four thin layers of lime, instead of two thick ones. As lime requires surface rather than thickness, the depth of lime on each tray should be not more than 5 inches. Two lime purifiers with eight surfaces of lime are better than three with six layers 9 or 10 inches thick; and four thin layers are better than two thick ones. Two purifiers in action at the same time are sufficient where the make of gas is from 20,000 to 80,000 cubic feet per hour; and the size of the purifiers should be from 28 to 30 feet square and 6 feet deep, and have four tiers of grids, with 14 yards of slaked lime on each tier. This would be about 5 inches deep. After the gas has been completely freed from carbonic acid, and treated for the removal of its bisulphide of carbon, it should be purified from sulphuretted hydrogen by being passed through two or three oxide of iron purifiers in the usual manner.

In conclusion, the writer feels bound to say that he has devoted himself for some years to finding out the best way of using lime for the purification of coal gas; it being in the year 1866 that he first commenced to use lime for the removal of carbonic acid and bisulphide of carbon. But he has never received any suggestions or information as to his method of working lime purifiers.

* For fuller particulars in the working of lime purifiers, the reader may be referred to the author's pamphlet on the "Purification of Coal Gas."

TECHNICAL RECORD.

NOTES ON THE ENRICHMENT OF COAL GAS.

(*Continued from p.* 585)

Enrichment by Carburetting.

This method of enrichment consists in adding to coal gas, by simple diffusion, vapours of hydrocarbons of high vapour tension. It is at once the simplest and quickest method of enriching coal gas in use. The hydrocarbon liquids employed are vaporized by means of an apparatus known as a carburetter. There are many types of carburetter; but the one most generally employed in this country is the Maxim-Clark, which was described and illustrated in the "JOURNAL" for July 6 last (p. 20). The hydrocarbon liquid is pumped from a store-tank into a multitubular evaporating chamber heated by superheated steam. The liquid is thus vaporized; and the vapour passes into a stream of gas drawn by an injector from the main stream of the gas which needs enrichment. The gas enriched by the vapour subsequently returns to the main stream; and the hydrocarbon vapour then becomes dispersed throughout the gas. The proportion of vapour admitted to the gas, and consequently the degree of enrichment of the latter, are determined by the temperature of the steam, and therefore by the steam pressure. A further control of the degree of enrichment is afforded by the amount of gas bye-passed to the carburetter. The Maxim-Clark carburetter is intended for the application of carburine as the enriching agent. A carburetter for the application of benzol, has also been described and illustrated in our pages.* This type of carburetter has been employed at the Munich Gas-Works. Another carburetter, designed by Mr. W. E. Price, was illustrated in our "Register of Patents" in 1895†. Some particulars of the application of petroleum spirit by means of this carburetter were also published.‡ Many other patterns of carburetters have been described in our "Register of Patents;" but the results of practical trials recorded in these "Notes" have been obtained by the use of one or other of the three patterns mentioned above.

The hydrocarbon liquids hitherto used for carburetting coal gas, have been either a mixture of volatile paraffins derived from American petroleum or light aromatic hydrocarbons of pyrogenic origin. It is essential to successful carburetting that the hydrocarbon liquid applied should consist almost wholly of hydrocarbons of high vapour tension, in order that, when the vapour of the liquid is diffused in coal gas, and the latter is subjected to a low winter temperature, no appreciable separation of the hydrocarbons from the gas through the condensation of the vapour to liquid may take place. Interdependently the hydrocarbons which form the bulk of the liquid must have considerable illuminating value, in order that only a small amount of their vapour may be necessary to impart the required illuminating power to the gas.

It will be instructive now to proceed to a consideration of the properties of ordinary carburetting liquids in the light of these conditions. The lowest temperature to which gas is likely to attain in the course of distribution in this country is about 20° Fahr. But since physical constants have been more commonly ascertained for a temperature of 32° Fahr., it will be more convenient to compare carburetting values at the latter temperature, and in practice allow ample margin in case a lower temperature is actually attained. It may be pleaded, in further justification of this course, that the streams of gas from which testing stations derive their supplies seldom do attain a lower temperature than 32° Fahr.

The mixtures of light paraffins which are used for carburetting gas are the fractions of American petroleum commonly known as gasoline, carburine, and petroleum spirit. Gasoline has a specific gravity of about ·650, and boils at about 104° Fahr. As already stated (p. 528), it consists chiefly of the pentanes and smaller proportions of their higher homologues. The vapour tensions of its constituent hydrocarbons are such that 10·7 per cent. by volume of its vapour saturates a gas at 32° Fahr.§ A considerably larger volume of normal pentane vapour is retained by a gas at that temperature; but only the commercial fractions of petroleum can be practically employed for carburetting. Gasoline appears, from small-scale tests, to have a value as an enricher of about 1350 candles per gallon; but doubtless this would not be secured on a large scale. In this country gasoline costs about 18d. per gallon; and it is therefore too expensive for common use as an enricher of coal gas. Coal gas saturated with pentane—the chief constituent of gasoline—at 32° Fahr., has an illuminating power of 62 candles (flat-flame burner); and therefore enrichment of coal gas by a few candles effected by gasoline would be absolutely permanent in the coldest weather in this country.‖

Carburine is the most popular carburetting agent. It has a specific gravity of about ·680, boils from about 135° to about 175° Fahr., and consists of hydrocarbons having vapour tensions such that about 8 per cent. of its vapour saturates a gas at 32° Fahr.* Its chief constituent hydrocarbons are the hexanes and smaller quantities of their homologues. Its cost in this country is about 8d. per gallon. A gallon of carburine, when vaporized, has a volume of 28·3 cubic feet at 32° Fahr., or very nearly 30 cubic feet at 60° Fahr. The enriching power of carburine diminishes notably as the degree of enrichment effected by it is increased. For the enrichment of coal gas by about two candles, 1 per cent. of carburine vapour has been found by Mr. J. F. Bell† to give an increase of illuminating power of 2·1 candles. As already stated, the hexanes appear from Dr. Bunte's researches to give the rather higher figure of about 2·5 candles. The following are a few of the published results which show the amount of coal gas enriched by 1 candle by the employment of 1 gallon of carburine:—

Enriching Value of Carburine (·680).

Candle Power of the Gas.		Number of Cubic Feet of Gas which 1 gallon of Carburine enriches by 1 candle.	Authority.	Comments.
Before Enrichment.	After Enrichment.			
—	—	2,800	C. Hunt ("JOURNAL," Vol. LXV., p. 371).	Sp. gr. of carburine used = ·6805.
16·00	18·00	5,700	T. Stenhouse ("JOURNAL," Vol. LXVI., p. 142).	Small scale test.
15·00	20·00	5,714	T. Holgate.	Average deduced from sundry sources.
20·38	22·96	5,750	T. S. Lacey ("JOURNAL," Vol. LIX., p. 903).	Flat-flame burner used.
15·00	17·00	6,060	J. F. Bell ("JOURNAL," Vol. LXIII., p. 1009).	Sp. gr. of carburine used = ·670.
14·50	16·00	6,705	J. Davis ("JOURNAL," Vol. LXX., p. 21).	Value inferred from figures given.
14·50 (?)	?	7,312	Quoted by T. Holgate.	Large scale trial at a Provincial works.
15·00	17·00	6,000–8,000	A. F. Browne ("JOURNAL," Vol. LXVII., (p. 1164).	Average deduced from sundry sources.
15·00	17·00	8,000	W. J. A. Butterfield (Text-Book, p. 147).	Average deduced from sundry sources.
15·50	16·50	8,000	W. B. Wright.	
14·88	19·86	8,085	J. Davis ("JOURNAL," Vol. LXX., p. 23).	Value inferred from small scale figures.
14·50 (?)	?	15,000	Quoted by T. Holgate.	Large scale trial at a Suburban works.

The extraordinary divergencies in the results obtained by different observers, are somewhat difficult of explanation. Mr. Hunt's figure for the enrichment performed by a gallon of carburine is so absolutely discordant with the rest, that it must be set aside, notwithstanding his prestige in research work of this class. The high value of about 8000 cubic feet has in some cases been achieved through the auxiliary effect of naphthalene, which had not been deposited from the gas to the extent common when carburine is not added to the latter. In works' tests on a large scale, the disturbing influence of naphthalene on the illuminating power of gas often vitiates the results observed for different carburetting materials. Excluding the high values shown in the table, because on a working scale they are scarcely likely to be the effect of the carburine alone, it seems that about 6000 cubic feet of ordinary coal gas can be raised 1 candle in illuminating power by the judicious expenditure of a gallon of carburine. This gives carburine a practical enriching value of only 1200 candles per gallon; but on the small scale as much as 1600 candles appears to have been secured. Assuming the practical value of 1200 candles per gallon, one-sixth of a gallon of carburine would enrich 1000 cubic feet of coal gas by 1 candle. With carburine at 8d. per gallon, the apparent cost of this enrichment would be 1⅓d. But if allowance be made for the addition to the volume of gas of 5 cubic feet due to the carburine vapour, the actual cost of enriching 1000 cubic feet of coal gas by 8 candles by means of carburine, becomes about 1·25d. Mr. T. Holgate assumes that 0·175 gallon of carburine enriches by 1 candle 1000 cubic feet of gas; and since carburine is obtainable at 7½d. per gallon in Halifax, he finds the net cost of enrichment by it, per candle per 1000 cubic feet, to be 1·218d. Mr. A. F. Browne‡ assumes that 1000 cubic feet of carburine vapour—no doubt at 60° Fahr. and 30 inches—yield 300 candles, and cost in London 26s., which is equivalent to about 9⅓d. per gallon for the carburine itself when vaporized in the holder. Thence he infers that the cost of enriching by 1 candle 1000 cubic feet of coal gas in London is 1d. It may be observed that he apparently assumes that about

* See "JOURNAL," Vol. LXV., p. 536.
† *Ibid.*, Vol. LXVI., p. 634. ‡ *Ibid.*, Vol. LXV., p. 535.
§ *Ibid.*, Vol. LXII., p. 718. ‖ *Ibid.*, Vol. LXIII., p. 485.

* See "JOURNAL," Vol. LXII., p. 717. † *Ibid.*, Vol. LXIII., p. 1009.
‡ *Ibid.*, Vol. LXVII., p. 1162.

0·1175 gallon of carburine suffices for the purpose. This is a smaller amount than he considers to have been generally required elsewhere under ordinary methods of using carburine.

Petroleum spirit is the fraction of American petroleum which boils from about 175° to 225° Fahr., and has a specific gravity of about ·700. It consists chiefly of heptanes, with small amounts of their homologues. The vapour tensions of its constituents are such that about 5 volumes per cent. of its vapour saturates a gas at 32° Fahr. It costs about 6d. per gallon in this country. When vaporized, 1 gallon of it has a volume of about 27 cubic feet at 60° Fahr. For the enrichment of coal gas by about 2 candles, 1 per cent. of the vapour of petroleum spirit has been found by Mr. Bell* to give an increase of illuminating power of about 1·8 candles. This result appears low, when compared with that which figures for enrichment in bulk by petroleum spirit would indicate to be probable, and when compared with the similar value for carburine. The following are a few results which show the amount of coal gas enriched by 1 candle per gallon of petroleum spirit employed :—

Enriching Value of Petroleum Spirit (·700).

Candle Power of the Gas.		Number of Cubic Feet of Gas which 1 gallon of Petroleum Spirit enriches by 1 Candle.	Authority.	Comments.
Before Enrichment.	After Enrichment.			
16·0	18·0	4,300	T. Stenhouse ("JOURNAL," Vol. LXVI., p. 142)	Small-scale test.
15·0	17·0	5,000	J. F. Bell ("JOURNAL," Vol. LXIII., p. 1009)	Do. Do.
16·01	17·09	10,286	H.L.Greville ("JOURNAL," Vol. LXV., p. 535)	Average of six large-scale trials.

These results differ considerably; and it is hard to decide which represents the true value of petroleum spirit under ordinary circumstances of carburetting coal gas. Mr. Greville's figures were obtained when using Mr. Price's carburetting apparatus referred to above. They are supported by Mr. W. Irwin's testimony that 1 gallon of heptane (fractionated from petroleum spirit) enriched by 1 candle about 10,000 cubic feet of coal gas. Probability seems to favour the view that the enriching value of petroleum spirit (·700) should be greater than that of carburine (·680). Mr. Holgate, however, takes the view that the enriching power of petroleum spirit is 0·825 that of carburine; and he estimates the cost of the spirit at 5½d. per gallon. Thence he draws the inference that the net cost of enrichment by petroleum spirit per candle per 1000 cubic feet of gas is 1·072d. Apparently Mr. Holgate has somewhat arbitrarily pitched upon the figure he has taken for the enriching value of the spirit. Mr. Greville assumes that the spirit costs 6d. on the works (Hampton Wick); and from his own researches, he concludes that the cost of similar enrichment is 0·58d. The wide divergence of these figures is remarkable; and probably enrichment by petroleum spirit would usually be found to cost about the mean of these two estimates—say, about 0·75d. per candle per 1000 cubic feet.

Enrichment by carburine is quite reliable and permanent for the ordinary case of from 2 to 3 candles. For a much greater degree, its permanency is somewhat dubious, and its cost is very excessive. Coal gas saturated with the vapour of hexane —the chief constituent of carburine—at 32° Fahr., has an illuminating power of 26 candles.† There is a wide margin between the amount of the vapour required for enrichment by 2 or 3 candles and the saturation point of the gas, even at 32° Fahr. Precise figures for petroleum spirit are not available; but there is no question that the vapour tensions of its constituents are such that its vapour can be retained by gas at 32° Fahr. in a quantity exceeding that necessary for enrichment by 2 candles. Adverse results with petroleum spirit have been probably due to attempts to employ it to furnish a greater enrichment, or to the use of an unsuitable carburetter.

The carburetting liquids so far considered, have all consisted chiefly of hydrocarbons of the paraffin series. Latterly benzene and the commercial benzols—which contain toluene also—have been employed fairly extensively for carburetting. Commercial 90 per cent. benzol, which is the mixture most in vogue for the purpose, is said to consist usually of about 70 per cent. of benzene, 25 per cent of toluene, and 5 per cent. of light impurities and xylenes. Its specific gravity is about ·881; and 90 per cent. of its volume distils over under 212° Fahr. The vapour tensions of the constituents of 90 per cent. benzol are such that about 2·7 volumes per cent. of its vapour appear to saturate a gas at 32° Fahr. In dealing with results of trials of benzol enrichment of coal gas, it is difficult in many cases to draw just conclusions, since the exact grade of benzol employed is often not stated. There is a wide difference between commercially pure benzene and 90 per cent. benzol; while the lower grades contain only a comparatively small quantity of benzene. Yet the terms are used almost indiscriminately in some reports of researches; and the value of the latter is thus greatly vitiated. Many of the widely diverging figures for benzol enrichment might perhaps be reconciled, if the description of benzol used had been recorded in each case. In the table given below, except where some other grade is explicitly stated, the values are believed on good grounds to refer to 90 per cent. benzol, which in many cases is named in the original papers. The amounts of coal gas which several observers have found to be enriched by 1 candle for an expenditure of 1 gallon of benzol, are as follows :—

Enriching Value of Benzol.

Candle Power of the Gas.		Number of Cubic Feet of Gas which One Gallon of Benzol enriches by One Candle.	Authority.	Comments.
Before Enrichment.	After Enrichment.			
—	—	9,500	C. Hunt ("JOURNAL," Vol. LXV., p. 371).	"Almost pure benzene" used.
14·5 (?)	?	12,431	Quoted by T. Holgate.	Large-scale trial at Provincial w'ks.
16·0	18·00	12,500	T. Stenhouse ("JOURNAL," Vol. LXVI., p. 142).	Small-scale test with "nineties."
16·0	18·00	13,300	T. Stenhouse ("JOURNAL," Vol. LXVI., p. 142).	Small-scale test with "chemically pure benzol."
14·5 (?)	?	16,240	Quoted by T. Holgate.	Large-scale trial at Suburban works.
15·0	17·00	20,000	J. F. Bell ("JOURNAL," Vol. LXIII., p. 1008).	
21·0	23·50	20,000	W. Irwin ("JOURNAL," Vol. LXVI., p. 140).	Higher values also found.
15·0	20·27	23,475	J. F. Bell (Quoted by T. Holgate).	Large-scale trial at Stafford.
14·0 (?)	18·50 (?)	24,500	H. Bunte ("JOURNAL," Vol. LXIII., p. 485).	Minimum value.
14·0 (?)	18·50 (?)	27,000—44,000	E. Schilling ("JOURNAL," Vol. LXIV., p. 736).	
15·0 (?)	17·00 (?)	30,870	H. Ries ("JOURNAL," Vol. LXIII., p. 197).	

These widely divergent enriching values for benzol are difficult of reconciliation, even if allowance be made for differences in the quality of the benzol, and between large and small scale tests. As with carburine, Mr. Hunt has obtained a much poorer result than other investigators. The results of the German experimentalists are fairly concordant, and are supported by those of Mr. Bell and Mr. Irwin. The latter gentleman, indeed, appears under rather different conditions to have secured a much higher enriching value for benzene than that stated; and Dr. Bunte gives a maximum value of about 30,000 cubic feet at the same time as the minimum recorded above. Mr. Holgate assumes that a gallon of benzol is capable of enriching 20,000 cubic feet of gas by 1 candle, and that the cost of benzol is 1s. per gallon. Thence he finds that the cost of enrichment by means of benzol is 0·6d. per 1000 cubic feet per candle. The market price of 90 per cent. benzol is now, however, nearly 2s. per gallon; and, therefore, if Mr. Holgate's enriching value for benzol be correct, the cost of the enrichment should be nearly 1·2d., instead of 0·6d. per 1000 cubic feet per candle. In face of the many higher enriching values attained, it seems reasonable to assume that a gallon of benzol is capable of raising by 1 candle the illuminating power of 25,000 cubic feet of gas. Taking this value, and benzol at 2s. per gallon, the cost of enrichment per 1000 cubic feet per candle becomes 0·95d.

Benzol enrichment is sufficiently permanent, within the small degree with which these notes deal. As has already been pointed out, gas at 32° Fahr. can retain at least 2·7 volumes per cent. of benzol vapour. Nearly 1 per cent. exists in common coal gas; but the surplus 1·7 per cent. which could be safely added to the gas would suffice to enrich it by about 14 candles. A comparison of the volume of gas enriched by 1 candle by a gallon of petroleum spirit, and by a gallon of benzol, shows that in most cases the enriching value of the benzol is three to four times that of the petroleum spirit. This ratio is interesting, since it indicates very clearly the immense difference between the illuminating values of the paraffins and the aromatic hydrocarbons. It is clearly very uneconomical of material to use a feeble enricher such as carburine in place of the better one; but practically the lower cost of carburine often makes it a cheaper carburetting agent than benzol. There are, however, indications that the production of benzol will shortly increase to an extent which will greatly reduce its market value. A considerable fall in the price of benzol will certainly place it in the position of being absolutely the cheapest carburetting agent known.

Researches do not appear to have been made on the carburetting value of light fractions of other than American petroleum. The vapour of the petroleum spirit from Russian petroleum would contain naphthenes and other hydrocarbons, having a higher illuminating value than the corresponding paraffins found in the products of American oil. Canadian petroleum, too, yields light oil consisting largely of olefines. On the other hand, the percentage of the light products from these oils is considerably less than that obtained from American

* See "JOURNAL," Vol. LXIII., p. 1009. † *Ibid.*, Vol. LXIII., p. 485.

petroleum; and consequently the distillers are less anxious to find a market for them.

Among other light hydrocarbon products which are available for the carburetting of coal gas, there should be mentioned the hydrocarbon residue from the compressed oil-gas works. This consists largely of benzene and homologues of acetylene. A sample of spirit produced from this material by Messrs. Davies and Roberts, of Stratford, is stated by Mr. Holgate to have given the following values as an enriching agent. It is said to give the best results when used in the cold; but these figures were obtained by the use of a Maxim-Clark carburetter heated by steam at 30 to 40 lbs. pressure per square inch. One gallon of the spirit raised by 1 candle the illuminating power of 15,275 cubic feet of gas at a Provincial works, and 20,000 cubic feet at one of the Suburban works. The figures are analogous to those given in the tables for carburine and benzol at the same places. But it should be added that the means of exactly determining the increase of illuminating power were wanting in both cases.

(To be continued.)

REGISTER OF PATENTS.

Incandescent Gas-Lamp Lighters.—Clément, C. P. J., and von Krohn, H., of Liége, Belgium. No. 20,331; Sept. 14, 1896.

The patentees point out that gas-lighters actuated by electricity from a distance, as heretofore used for lighting incandescence lamps, possess no device for closing the gas-valve, but are merely provided with valves or cocks which operate with great frictional resistance, or else are liable to become leaky and supply the gas irregularly. The lighting-device is generally placed outside the crown of the burner, which renders the replacement of the incandescent body difficult, and causes the lighting to take place always at the centre—below the mantle, thereby shortening its life.

With the lighter forming the subject of the present invention, the opening and closing of the gas admission orifice is effected by raising and lowering the core of a coil, the lower extremity of which is bell-shaped, and can be dipped at will into mercury. Apparatus for lighting by an induction spark is provided in the centre within the burner-head, and insulated by an incombustible and non-conducting substance in such a manner that all parts of the lighter and of the head of the burner can be taken to pieces for cleaning, without deteriorating the conductors. The contact is automatically made when the circuit is closed; one of the conductors being at the centre within the burner-head, while the return conductor is formed by the external part of the burner. The incandescence mantle can thus remain in place without being interfered with in any way.

Protecting Incandescent Mantles during the Cleaning of Street-Lamps.—Cripps, F. S., of Great George Street, S.W. No. 20,626; Sept. 18, 1896.

This protector consists of a hollow vessel, which can be temporarily fixed during the process of cleaning the lantern, and which so encloses the burner as to completely protect the burner, mantle, and chimney from damage. The protector, which is designed to be rigidly fixed at the base of the lantern, is cylindrical, telescopic, or of other convenient form, so as to enclose the internal lantern fittings; and it is fixed in any convenient manner at the base—for instance, slipped over a projecting collar, or slid in grooves or lugs formed in the base-frame of the lantern, or slipped down over vertical rods. In the case of globe lanterns, the protecting vessel is slipped either down or up (according to whether the lamp is supported from below or swinging from above); and it is guided, by vertical rods or otherwise, so as to keep it free from striking the burner.

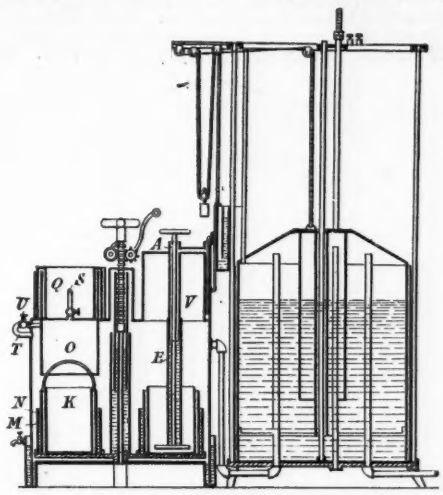
Gas Motor Engines.—Lanchester, F. W., of Alvechurch. No. 22,935; Oct. 15, 1896.

This invention relates to construction details of gas and oil motor engines. Part of the invention relates more particularly to the valve and governor gear, whereby noise and wear and tear are said to be minimized, and starting is rendered easy. Another part of the invention provides an improved system of lubrication, in which the supply of lubricant to the bearing surfaces is controlled automatically.

The principal claims made by the patentee are: 1. In valve-gear for gas and oil engines, the provision of a disc with two slots at right angles, having blocks sliding in these slots, and pins upon which the blocks pivot, attached to the crank-shaft on either side of its axis, as a means for giving the necessary two-to-one motion to the engine-cams. 2. The provision of a balanced lever weight, carrying the usual hit-and-miss governing blade, on the end of the gas-valve lever, as a means for governing. 3. The provision of a lateral adjustment on a light shaft carrying the cam working the igniting trigger or lever, and driven by helical gear from the engine as a means for altering the time of ignition.

Production and Storage of Acetylene.—Kerr, J. G., and Fry, C., of Niagara Falls, Canada. No. 8989; April 8, 1897.

The action of this acetylene generator (as shown in the engraving) is as follows: Water entering the supply-pipe A, flows through the tube E, and overflowing at the top falls upon the carbide in the receptacle K below it—acetylene gas being thus generated. When the carbide has become exhausted, the base-plate carrying four carbide receptacles is swung through a quarter of a circle, so as to bring a fresh receptacle below the water-supply pipe. After two carbide receptacles have become exhausted, and the third is in position for use, the first used receptacle is below the cylinder O, which then dips into the annular water-space N, and seals the receptacle below the cover Q, from the body of the generator. As the cylinder is raised, the tap U is opened; and most of the acetylene gas within the tube is forced out into the generator. As soon as the receptacles have been raised as far as possible, the tap is closed; and then, to consume what small amount of gas remains within the cylinder, the jet S is opened and lit. When it ceases to burn, the cover Q is lifted, and air enters through the jet and mingles with the traces of acetylene remaining. When the cover has been removed from the carbide receptacle below, it may be lifted out, and a receptacle full of fresh carbide inserted in its place. The cover is then replaced, and the tap U again



opened. The base-plate and receptacles are then lowered to their normal position; the gas from the pipe T serving to fill the cylinder till the water-seal is withdrawn from it and the gas enters freely at its lower end. The cylinder V serves to receive the upper ends of the diametrically opposite carbide receptacle and cylindrical wall M, at the same time that the similar parts of the opposite wall M and receptacle are raised through the cylinder O.

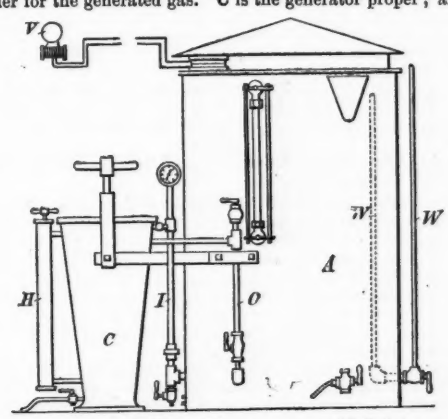
Preparation and Use of Calcium Carbide for the Generation of Acetylene.—Smith, F. H., of Dunblane. No. 13,103; May 27, 1897.

The patentee proposes to reduce carbide of calcium to powder or to a fine crystalline state, and then compress it into tablets or balls, with or without the addition of some adhesive substance, or convert it into a heavy dough or pill-mass, by the addition of any suitable substance which will not evolve gas when in contact with the calcium carbide—such as an oil. The compressed tablets or balls, and the pills, tabloids, or pieces obtained from the dough or pill-mass, are then coated with wax, varnish, or other waterproof substance; and when required, it would only be necessary to drop one or more pills or tabloids at a time into the water, instead of, as heretofore, the water being caused to drop on to the carbide.

This "inventor" does not put himself to the trouble of designing an appliance for the proper use of his "pills," but suggests that they "may be supplied to the gas lamp or generator by any suitable automatic means." For example, he says, a number of balls or pills may be contained within an upright tube, one ball resting upon the other; the arrangement being such that, as the gas gets exhausted, one or more pills are mechanically caused to be dropped out of the end of the tube into the water below. But mark his further ingenuity: "In order to allow the water to act upon the carbide contained within the wax coating of the pills, I may provide any suitable automatic scratching arrangement—such, for example, as the rising or falling of the gas-pressure causing a roughened surface of a rod or plate to rub against the side of the pill, and scratch a hole through the varnish—so as to enable the water to come in contact with the carbide."

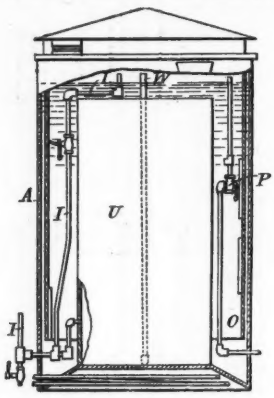
Acetylene Gas Generator.—Mitchell, F. A., of Wilmington, U.S.A. No. 13,496; June 1, 1897.

In this type of acetylene generator, there is arranged within the water-reservoir A, and adapted to rise and fall in it, a casing intended to serve as a holder for the generated gas. C is the generator proper; and fitted



within it is the carbide holder. Means are provided for removing all gas remaining in the generator, and conveying it to the holder—viz., a pump H, adapted to force the gas through the pipe I, which leads from the generator near its upper end downwardly through the reservoir A near its lower end, and thence upwardly within the reservoir, and discharging the gas at a point above the highest water-level therein.

A cock or valve P in the pipe O has rigidly mounted on the extended plug an angular lever R, one arm of which is weighted so that, in the normal position of the lever, the plug will be in a position to supply water to the fullest extent through the passage; but when the lever is partially turned in either direction, the supply will be diminished or entirely cut off, according to the extent to which the lever is turned. The inner wall of the holder is provided with two blades or ribs in practically the same vertical plane, with a space separating them. These blades are adapted to strike the arm of a lever when the holder rises and falls, and thus turn the plug of the cock from its normal or fully open position. When the



quantity of generated gas increases, and the holder accordingly rises, the valve gradually cuts off the feed of water to the generator; and as the gas is consumed, the holder will begin to fall and the lever resumes its normal position. Should the holder rise very high, the valve cuts off the flow of gas into it, and any further accumulation of gas will flow to the storage or overflow tank or holder U, arranged within the holder. By reason of this tank U being surrounded by water, the gas in it will be cooled; and the tank, by occupying considerable space within the holder, reduces the quantity of water necessary for operating the apparatus.

In order that a signal may be given to indicate that the carbide is becoming exhausted, a bell V is adapted to be operated mechanically by the holder, when the latter is reaching its lowest limit of movement; or the bell may be operated electrically by providing contact-plates—one on the gasholder, and the other on the water-reservoir—and arranging electrical connections between the plates and the bell.

W is the gas service-pipe, which leads from a point above the high-water level downwardly within the holder and out through the reservoir casing, and thence to the point at which the gas is to be used.

The operation of the apparatus may thus be briefly described: The holder having been charged with carbide of calcium, the cover firmly secured, and water having been supplied to the reservoir until the high-water level is reached, a full feed of water is allowed to flow into the generator, and down the inner wall of the holder to act upon the carbide therein. The cock is then closed, and as the gas is generated it is discharged within the holder above the water-level. As the generation continues, the holder rises and gradually permits the plug of the valve P to gradually open, which it does to its greatest extent when the blade clears the arm. But as the holder continues to rise, the valve cuts off gradually the supply of water to the generator. As the carbide becomes exhausted, the holder descends gradually lower until the feed of water is entirely shut off. Then the alarm will be actuated to give warning of the exhaustion of all carbide, and the generator may be emptied of its exhausted carbide and fresh carbide placed in the holder.

Gas-Engines.—Westinghouse, G., and Rudd, E., of Pittsburg, U.S.A. No. 13,517; June 1, 1897.

This invention relates (according to the claims of the patentees) to an internal combustion (or explosive) gas-engine adapted to effect a regular and uniform rotation of the main shaft; to valve-gear for operating one or more valves by motion derived from the main shaft of the engine; to regulating apparatus for effecting a mixture of the air and other gases and varying the capacity of, or entirely closing, the passages through which the air and other gases are supplied to the cylinder, "whereby the mingling of the gases may be effected, and the quantity and relative proportions of the air and other gases may be varied;" to means for effecting the ignition of the gases in the cylinder or combustion chamber of the engine; and to "certain combinations and features of construction," all fully set forth in a lengthy specification of some 10 pages, with 42 claims, and accompanied by 10 sheets of detail drawings.

Gas-Making Apparatus.—Jones, H. A., of Brooklyn, U.S.A. No. 14,471; June 15, 1897.

This apparatus is designed to generate coal gas and water gas from soft or hard coal or coke and steam, and also to produce oil gas—the gases being combined to form an illuminating gas.

Fig. 1 shows a vertical section of the main chamber and the oil-evaporating chamber of the apparatus. Fig. 2 shows the pipe connections of the oil-evaporating chamber; the chamber being in section. Fig. 3 is an elevation of the apparatus on a smaller scale, showing the gasholders and all the connections for conveying gas, but (for clearness) omitting the steam connections.

The part of his apparatus which the patentee terms the cupola, consists of a main chamber A, of cylindrical form, about 5 feet in diameter and 10 feet high. Around the sides of the chamber, and forming a part of its lining, are zigzag coal-gas retorts B. Each retort is made of two angularly connected inclined sections. The charging-device and valve at the top of each retort consists of a cylindrical chamber C, open on one side, which fits in a cylindrical opening across the upper protruding end of the retort. When this chamber is rotated, to bring its opening upward, it is filled through the hopper with soft coal, which is discharged into the retort by rotating the chamber so as to bring its opening on the under side. In all positions the valves seal the retorts, and prevent the escape of the coal gas into the air; and as the gas is generated, it finds its way through the outlets D of the retorts, which lead from just below the valves into a pipe E encircling the cupola.

Fig. 1.

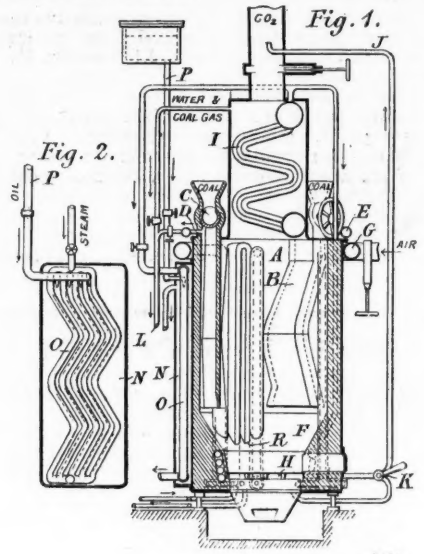
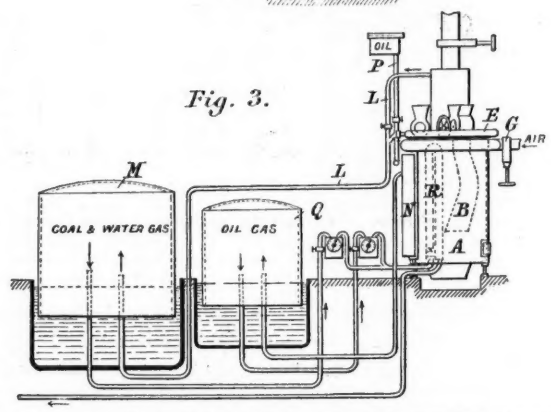


Fig. 2.

Fig. 3.



As the soft coal descends through the retorts, it is converted into coke, while the coal gas is driven off. The coal receives support from the lower inclined sides of each section, so that when near the bottom of the retorts it will not be unduly packed by the coal above; and as the sections are angularly connected, the direction of the descending column is changed at each bend, and the column broken up, in order to keep it open and free for the disengagement of gas. There is a flaring downward to prevent any wedging of the descending coal.

The retorts open downward at the bottom, and discharge the fuel from them over the inclined sides of the boshes F of the main chamber. As these openings have no valves, the top of the bed of fuel in the main chamber must be as high as the bottom of the retorts, in order that they may retain their charge. As the fuel in the main chamber is used up in the production of water gas, it is automatically replenished from the retorts, and the fuel line maintained even with their discharging ends.

The air for combustion passes through a valve into a pipe G encircling the cupola. From this it passes into and down flues around the interior of the main chamber, and into tuyeres which discharge it under the grate-bars H. In descending through the flues, the air takes up the heat of the combustion in the main chamber, which would otherwise be conducted in part through the lining, or pass out of the chimney and be lost. The products of combustion pass up around the pipes I of a tubular boiler, making steam, and then into the chimney. The steam is conducted down to a coil surrounding the lower part of the main chamber, where it is superheated. When the combustion is going on, the steam exhausts into the chimney through a pipe J, to promote the draught. When the coal has been raised to incandescence, the combustion is stopped by closing the valve on the pipe G. The valve K is turned at the same time, shutting off the steam-jet in the chimney, and directing the superheated steam through a nozzle into the fire-chamber through the grate-bars—the steam acting on the incandescent coal, generating water gas. The valve in the chimney is now closed, and the gas is drawn off through the pipe L, which conducts into a holder M both the coal gas generated in the retort and the water gas generated in the main chamber.

At the side of the cupola, and attached to it, is an oil-vaporizing chamber N. Zigzag steam-pipes O, with a general vertical direction, are contained in this chamber, and are located so that the sections of the zigzags of adjoining pipes alternate under each other. The sections in the series of zigzag pipes which lie under other sections, have grooves on their upper sides. Oil is fed by a pipe P between each pair of steam-pipes through nozzles, at the uppermost grooves of the sections. The course of each of the streams of oil in descending is zigzag; for, after running down to the end of any section, it drips into the upper end of the groove in the section of the adjoining pipe, and thus alternates backwards and forwards between the pipes until it is vaporized. The resulting oil gas is conducted to an oil-gas holder Q.

From the holders M and Q, the mixed gas and the oil gas are drawn off through meters, in just such proportions as are necessary for the desired candle power, and enter together a fixing-retort R. At the bottom, where they enter, their mixing is assisted by passing them through an open construction of fire-brick. The retort has two branches joined together at the top; and all of it but the lower ends of these branches is exposed to the heat of the main chamber. The mixed gas travels up one branch, over the bend at the top, and down the other branch, where it passes off to the customary scrubber, purifier, and distributing holder.

Casings for Gas-Meters.—Johnson, J. Y.; a communication from W. H. Hopper, of Philadelphia, U.S.A. No. 16,403; July 10, 1897.

The patentee's proposal is to make the bottom and side plates of the casing of gas-meters in one piece, and provide grooved or V-shaped flanges for the reception of the edges of the front and rear plates and gallery plates of the casing. In this way, it is claimed that, "not only is the assembling and fitting of the parts facilitated, but the strength and security of the casing are increased; the number of soldered or brazed joints to be formed is decreased; and the expense of constructing the casing is correspondingly diminished—less skill being required in the operation than is demanded in making an ordinary casing."

Gas-Engines.—Russ, J. D., of Brooklyn, U.S.A. No. 16,631; July 13, 1897.

Prefacing his specification, the patentee remarks that the perfect gas-engine cycle consists of four distinct operations—intake of fresh charge, compression, explosion, and exhaust; and it has been the aim of all designers of these engines to embody the four cycles in as few strokes of the piston as possible, as only one of the above operations is actually power-producing. Four-cycle engines employ four strokes to accomplish the cycle; while two-cycle engines have utilized crank cases, accessory cylinders, and pumps, or employed a differential piston to gain their end. In all these engines, however, the "intricate mechanism has prevented high speed, as well as caused difficulty in operation and management." The object of his invention, therefore, is "by the use of one plain cylinder, without accessory contrivances, to accomplish in one revolution the four operations of this perfect cycle."

Generally stated, the cylinder is closed at both ends, and has a piston in it. An automatic valve-controlled port leads to a space behind or below the piston; and between this part of the piston and the lower head or back of the cylinder, there is a passage, with open communication to, and leading from, the before-mentioned space behind or below the piston, through an automatically valve-controlled port into the head of the cylinder. The explosive mixture is thus first admitted into the lower portion of the cylinder, and then forced by the action of the piston into the upper part of the cylinder, where it first expands, clearing the cylinder of the old gases, and where it is afterwards compressed and exploded.

APPLICATIONS FOR LETTERS PATENT.

20,225.—Freudenthal, L., "An improved solution or fluid for impregnating incandescent bodies." Sept. 2.

20,302.—Brown, C. G., "Adjustable draught regulator for incandescent gas-burners." Sept. 3.

20,319.—Salzenberg, E., "Incandescence gas lighting." Sept. 3.

20,381.—Sinclair, J. A., and Powell, E. R., "Production, storing, and cooling of acetylene gas." Sept. 4.

20,405.—Bryan, W. E., "Preventing water-supply pipes freezing and bursting." Sept. 6.

20,411.—Oldfield, T., "Utilizing the products of combustion from gas and oil engines for heating water or warming rooms." Sept. 6.

20,421.—Jensen, G. J. G., "Testing and tracing leakages in gas-pipes and gas-pipe systems, and other pipes or systems of pipes." Sept. 6.

20,433.—Doller, F., "Automatically igniting the gas in, and turning on and off the gas-cock of, incandescent gas-lamps." Sept. 6.

20,509.—Glover, R. T. & J. G., "Coin-freed gas and other fluid meters." Sept. 7.

20,524.—Peach, C., "Anti-vibration appliance for use in incandescent gas lighting." A communication from A. Vaughan. Sept. 7.

20,532.—Petit, C., and Gavrel, G., "Manufacture of acetylene gas." Sept. 7.

20,537.—Windham, F., and Fry, E., "Portable lamp for producing gas from carbide of calcium." Sept. 7.

20,571.—Kahns, O., "Production of carburetted air for incandescent gas lighting." Sept. 7.

20,574.—Lebrun, G., and Cornaille, T., "Burner for acetylene and other gases rich in carbon." Sept. 7.

20,761.—Roots, J., "Internal combustion engines." Sept. 9.

20,823.—Kent, H. A., "Inverted regenerative incandescent gas-lights." Sept. 10.

20,839.—Gardner, H., "Coin-freed gas-meters." A communication from J. R. Henderson. Sept. 10.

20,886.—Dymond, J., "Apparatus for producing luminous water gas." Sept. 11.

20,912.—Bayle, P., "Burners for incandescent and other gas-lamps." Sept. 11.

The Purchase of the Dudley Gas-Works by the Corporation again Suggested.—At last Tuesday's meeting of the Dudley Town Council, Alderman Bagott, in moving the adoption of the Streets and Gas Committee's report, remarked that a great deal had recently been said respecting the purchase by the Corporation of the Dudley Gas-Works. Since 1865, three attempts have been made by the Corporation to acquire the works; but on each occasion the price asked had been prohibitory. Everyone was in favour of purchasing the gas-works; and if it were true that loans could now be obtained at 2½ per cent., it appeared to him that the present was an opportune time to make a step in this direction. They must, however, remember that they had already obtained an Electric Lighting Order; and from inquiries he had made, he was convinced of the desirability of adopting electricity as a means of public illumination.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Should Picketing be Allowed?

Sir,—The unsatisfactory state of the Conspiracy Law is a general theme of discussion in industrial circles; and it is generally agreed that it requires amending, though there are, of course, differences of opinion as to the form such amendment should take. The indefiniteness of the present law causes it to be variously interpreted on the Judicial Bench. Language and conduct which may be regarded as legitimate "persuasion" by one Judge, may, under other circumstances and by another Judge, be treated as "intimidation." Hence the complaints of bias made at the Trade Union Congress. The Conspiracy and Protection of Property Act, 1875, prohibits the use of violence and intimidation by strikers. It forbids them, under penalty, to molest or follow any man who wishes to work; but it has a qualifying clause, which runs as follows: "Attending at or near the house or place where a person resides, or works, or carries on business, or happens to be, or the approach to such house or place, in order merely to obtain or communicate information, shall not be deemed a watching within the meaning of this section." This is a permission to "picket," provided no violence or intimidation be resorted to. But it has been abundantly shown since the Act was passed that "picketing" almost always takes the form of intimidation. This clause should therefore be repealed.

It may, as pointed out by a recent writer on the subject, Mr. W. J. Shaxby, be impossible by legal means to prevent picketing altogether, just as it would be impossible to entirely prevent electoral canvassing. But at all events, the law should not by this clause expressly permit picketing, while punishing with severity those who often unwittingly overstep the bounds between "persuasion" and "intimidation" when availing themselves of the permission given by the law.

There would be no hardship in prohibiting picketing. Indeed, it would be real kindness to prevent men from getting into the false position of "pickets." When men have ceased to work for a firm, they should not be allowed either to hang round its doors themselves, or send anyone else to do so. If strikers are acting voluntarily, they do not need picketing. To picket them is for the strike leaders to admit that their ascendancy over the men depends upon terrorism. So far as concerns free labourers who want to take the places of the strikers, to picket them is to try to intimidate them from working, and to interfere with their right to dispose of their labour in the free and open market. As regards the employer—for even he has his rights—he also is by picketing more or less debarred from his right of free access to the market. If the law does not give the needed protection from this growing nuisance of intimidation by pickets, employers and free labourers cannot be blamed for combining in defence of interests which are not theirs alone, but also those of the general community, and especially of the wage-earning classes.

7, *Victoria Street, S.W.*,
Sept. 16, 1897.

Frederick Millar, Secretary,
Free Labour Protection Association.

Sandwich Gas-Works Extension.—The Local Government Board have sanctioned the application of the Sandwich Town Council for a gas-works loan of £8100, to be repaid in 17 years; but they point out that no buildings connected with the gas-works should be erected except on land described in the schedule to the Order.

The Wages of Gas Stokers at Driffield.—The recent application of the stokers employed at the Driffield Gas-Works for an advance of wages has been under the consideration of a Sub-Committee of the Gas Committee; and, after conferring with the men, they advised an addition to the pay of 2s. per week; making it 28s. The recommendation has been approved by the District Council.

Windsor Gaslight Company.—The financial statement presented at the recent half-yearly meeting of this Company disclosed a very satisfactory state of affairs. The income in the six months was £9250, and the net profit £2322, against £2297 in the corresponding period of 1896; and this notwithstanding a reduction of 2d. in the price of gas last year. The sale of gas also increased by 2,091,720 cubic feet. The report was adopted.

Reductions in Price.—The Formby Gas Company, Limited, have reduced their price (as from July 1) from 5s. to 4s. per 1000 cubic feet. The Mold Gas and Water Company have intimated to the District Council that they have resolved to reduce the charge for gas by meter from 4s. 4d. to 4s., and street-lamps from 6s. 6d. to 6s. per month. The latter price includes lighting and cleaning. The Keith (Banffshire) Gas Company, have reduced the price of gas from 6s. 8d., to 6s. 3d. per 1000 cubic feet. The Carnoustie Gas Company have reduced their price from 4s. 7d. to 4s. 2d. per 1000 cubic feet—the third year in succession in which the Company have taken 5d. off the price.

The Purchase of the New Hunstanton Gas and Water Works by the Urban District Council is now approaching completion. At a meeting of the Council on the 10th inst., the Chairman (Mr. Pattrick) reported that he and the Clerk had not been able, owing to the long term of years for which the loan of £28,000 for the water and gas works purchase was required, to obtain an offer at a less rate than 3½ per cent. As the purchase of the undertakings must be carried out on the 1st prox., they had arranged for a temporary advance for two months of £19,000 at 4 per cent.; so that they might be able to settle the purchase, and have time to arrange the permanent loan. It was unanimously agreed that the sum of £19,000 be so borrowed on the security of the gas and water undertakings and the general district rate and district fund; and also that an order be drawn upon the Treasurer for the payment of the purchase-money. Messrs. Partridge and Co. wrote asking whether the Council would take over their employees, and suggesting that the Council should name an Engineer to value the water stock with Mr. Valentine, their Engineer; also that Mr. E. G. Smithard, of King's Lynn, should value the gas stock on behalf of both the Company and the Council. It was unanimously agreed that the Company should submit Mr. Valentine's valuation for the consideration of the Council, and that the suggestion as to Mr. Smithard should be accepted.

MISCELLANEOUS NEWS.

PROPOSED NEW GAS-WORKS FOR EDINBURGH AND LEITH.

Mr. W. R. Herring, the Engineer to the Edinburgh and Leith Gas Commissioners, has presented the following report to that body on a proposal for the erection of new gas-works:—

In consequence of the increasing demand for gas in the Edinburgh, Leith, and Portobello divisions—the increase for the Edinburgh district during the year ending May 15 being 5·77 per cent., and for the Leith district for the same period 5·33 per cent., or a total of 87 million cubic feet, and the increase from that date for the succeeding three months to Aug. 15 being an average of 6·57 per cent.—it is important that the question of providing further plant and appliances to meet this increasing demand should be considered by the Commissioners.

The present works were during last winter yielding their maximum output of gas, and under conditions which were not conducive to economy of manufacture. The maximum output during the past winter on any one day was 8,960,000 cubic feet; the maximum make of gas, 8,447,000 cubic feet. The water-gas plant, which will be ready for next winter's requirements, is capable of yielding a maximum of 2 millions per day; but as it is only intended to mix about 20 per cent. of water gas with the coal gas produced at the New Street works, this will permit of our depending upon, approximately, 1 million cubic feet of gas per day, and will be equivalent to an additional output of 11 per cent. over last winter's maximum consumption. As the increased consumption during the present year is 6½ per cent., the margin of safety is by no means large. The continuity of the supply of gas is also dependent upon the coal supply. Any serious interruption of the railway traffic or the mining industry would bring the Commissioners face to face with a state of affairs of the greatest gravity. The available room for coal storage in the works is only equivalent to 15 days' maximum work. In fact, and particularly at New Street, we are dependent from hour to hour upon the delivery of coals by the Railway Company—a condition of affairs which should not exist, when the consequences of the town being plunged into darkness are taken into account.

The storage capacity of the various gasholder stations is also deficient, during last winter 2¾ million cubic feet of gas per day being sent out above the storage capacity of the gasholders; and as it would take at least two years to complete a gasholder and tank, the deficiency of storage capacity for 1899 I estimate to be upwards of 4 million cubic feet.

I have, for the present, refrained from calling your attention to the deficiencies of some of the existing plant at the various works, and also the necessity within the next year or two of reconstructing considerable portions thereof, to ensure the continuity of the gas supply apart from meeting the increasing demands.

The ways and means, however, of providing for these increasing demands, requires the most careful consideration at the hands of the Commissioners.

There is no available room at the New Street gas-works for further extensions of any kind. There is, however, sufficient ground for an extension of the manufacturing plant at Leith. But owing to the substratum being water-logged sand, and the water-line but a few feet below the road level, it cannot be said to be a satisfactory site for the requirements of a modern plant, without a greater amount of money is expended thereon than would be necessary with a site of a more suitable substratum. There is also available land for the construction of a gasholder and tank equal to a capacity of 1½ million cubic feet at the Blandfield depôt.

After most carefully considering the present condition of the gas supply, I am of opinion that the time has arrived when the Commissioners must be asked to seriously consider the necessity of their immediately grappling with the question of the transfer of the whole of the manufacturing operations from their present sites, and their concentration upon a new site, on which, in the first instance, all future extensions of plant should be laid down, and, as opportunity arose, the transfer of such plant as is worth removing from the existing sites to the new centre of operations.

The Directors of the Edinburgh Gas Company sought the transfer of their works to a new site ten years ago, since which time plant has been put down on the site as it then existed equivalent to the production of 257,120,000 feet per annum, or equal to an increase of 30·63 per cent.

The cost of manufacture on the present sites is considerably greater than it would be upon a suitable site, on which there was room for the proper manipulation of the materials to be dealt with in connection with the operations of manufacture and purification. The introduction of modern appliances in connection with the various processes, would also considerably reduce the present cost of manufacture.

There is another very important point affecting the commercial prosperity of the undertaking—namely, the railway communication. At the present time, you handle traffic to the extent of 278,648 tons per annum. Your present works are situated on the North British Railway system, thus giving the latter Company the monopoly of your traffic; while, at the same time, many coals and cannels, otherwise suitable, cannot gain access to your works owing to their being situated on the Caledonian system, and unable to compete owing to the transfer rates, which are equivalent to about 1s. per ton of coal.

The disadvantages of the present sites as compared with one central site, suitably situated for the receipt of coal and other materials, and the export of residual products, together with the disadvantages of being upon one railway system only, I have no hesitation in saying are equivalent to a charge of at least 2s. 6d. per ton of coal carbonized, or a total of upwards of £20,000 per annum.

I am fully conscious of the importance of the opinion I have given—imposing, as it appears to do at first sight, a formidable financial undertaking. Apart, however, from it being an urgent necessity, it will also be a profitable undertaking, when once the new plant can be got into operation; and when I tell you that a charge of less than 2d. per 1000 cubic feet of gas sold would be sufficient to cover interest and sinking fund charges upon the capital outlay on the first instalment of the new works, equivalent to an output of 5 million cubic feet per diem, at an estimated outlay of £225,000, exclusive of land, or a charge of 1$\frac{3}{5}$d. per 1000 cubic feet sold, it may relieve you of the anxiety which might otherwise be present in your minds.

At the present time, 1d. per 1000 cubic feet of gas sold realizes a sum of £6500 per annum, and is sufficient to pay interest representing capital and sinking fund charges at the rate of 4 per cent. per annum on a capital outlay of £162,500.

In conclusion, permit me to point out that it will be at least three years before the utility of any new work can be relied upon to supplement the present plant. For this reason, I would, therefore, ask that the matter be dealt with with as little delay as is consistent with making the best arrangements for the future supply to the Gas Commissioners' area.

THE LEAMINGTON GAS-WORKS PURCHASE QUESTION.

The Proposal Abandoned.

At a Meeting of the Leamington Town Council last Monday, the General Purposes Committee reported, *inter alia*, as follows: "Mr. Thomas Newbigging, C.E., attended before the Committee with reference to the suggested purchase of the gas-works. It was proposed by Alderman Wackrill, and seconded by Councillor Barrett, that the report of Mr. Newbigging be received and approved; and that this Committee recommend the Council to offer to purchase the gas-works undertaking upon the terms named in Mr. Newbigging's printed report.* An amendment was moved by Councillor Bright, and seconded by Alderman Eardley-Wilmot, that, after hearing the report of Mr. Newbigging, this Committee does not recommend the Council to proceed further with the project of buying the gas-works. On the amendment being put, 13 voted in favour, and 7 against. The amendment was then put as a substantive resolution; and 13 voted in favour, and 7 against. Alderman Wackrill proposed, and Councillor Bright seconded, 'That a hearty vote of thanks be accorded to Mr. Newbigging.' Carried unanimously."

Mr. Heath Stubbs raised a discussion upon the question. It appeared to him, he said, that there must be members of the Council who had not made up their minds at all that it was desirable to purchase the gas-works, not even when the subject was referred by them to the Committee, and an expert engaged. One could hardly conceive that upon Mr. Newbigging's report anyone who previously thought the purchase desirable could be induced to alter his opinion. He still believed that if they could have acquired the works on Mr. Newbigging's terms, as the Sub-Committee recommended, they would have been an advantage to the town. However, he was not going to move an amendment, because he felt practically certain that the Gas Company would never sell on the terms named by Mr. Newbigging. He hoped the members would not in future put the ratepayers to these expenses, unless they had some serious intention of dealing with the subject.

Mr. Bright then gave his reasons for moving that the negotiations for the purchase of the gas-works should be dropped. Mr. Newbigging had recommended a 28 years' purchase; but he (Mr. Bright) had found since Mr. Newbigging's report was before them that Leeds purchased its gas-works on a 23 years' purchase basis; Rotherham, 24; Dundee, 24; St. Helens, Wigan, and Bolton, 22½ years. They were asked to purchase, at a longer period, what, by Mr. Newbigging's report, was by no means a prosperous or sound concern, and would avowedly require a very large outlay to be kept in good working order. They were asked to mortgage their property to the extent of £123,000. The preliminary expenses would be another £5000—making, in all, £128,000; and what for? For £50 per annum. He thought he need not say that this was a speculation that the Council would never undertake; and if they did, the ratepayers generally would not support them. The Gas Company could not make a profit over a certain amount—any surplus above this sum had to go towards a reduction in the price of gas. Mr. Newbigging, in his report, pointed out that all the larger establishments were giving up gas and taking on electricity at 8d. per unit—equal to 4s. for gas—and what would they do when they could get it at 2d. and 4d. per unit? If the demand for electricity increased, how would they do when they had pledged the property of the town at very nearly its rateable value? He thought the resolution to drop the subject altogether was a very wise one.

Mr. Fell accused the last speaker of straining his facts for the purposes of his argument. He had quoted purchases of the period of 1870, when money was very much dearer than now. Further Mr. Newbigging had taken into account the bad condition of portions of the gas-works plant. The fact that the profit assessed was after the necessary amounts had been allowed by Mr. Newbigging for repayment of capital and interest, never entered into his calculations, because he wanted the ratepayers to believe the policy of purchase would be suicidal. He was the champion of a class which had lost the gas-works to the town for 40 years' time. The population of Leamington was not liable to the fluctuations of great trade centres, and there would always be consumers. With reference to electricity, as bearing upon this question, he considered that never in his lifetime would the Council see electricity produced at a price equal to 1s. 6d. per 1000 cubic feet for gas, as Mr. Bright had stated would be possible.

Alderman Wackrill said if it had not been for the unfair position in which Mr. Newbigging had been placed, he should not have spoken upon the gas-works purchase question at all. Anyhow, if they could secure the works at the price named, the purchase would be worth while. The Gas Company's last report showed that, compared with twelve months ago, the works were worth nearly £30,000 more. He was certain the Council had done wrong in refusing to buy out the Company; but he should support the report which said they should not purchase, hoping that in future if the Council went into work they would undertake it earnestly and conscientiously.

Mr. Wench was glad Mr. Fell had had an opportunity to make his remarks, as he thought that, if there was this feeling on the part of the Council of not purchasing, it should have been shown at the outset. The offer ought to have been made to the Company; and if it had been refused, it would have given an impetus to the securing of an Electric Lighting Order.

No formal motion was made to alter the report of the General Purposes Committee, with reference to no further proceedings being taken with regard to the gas-works purchase question; and the report was adopted with three dissentients.

* See *ante*, p. 444.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday—Sir Frederick T. Mappin, Bart., M.P., in the chair.

The General Manager (Mr. Hanbury Thomas) having read the notice convening the meeting,

The Chairman moved the adoption of the Directors' report and the accounts (see *ante*, p. 393). He said he thought the shareholders would agree with him that there was every cause for satisfaction with the working of the Company for the past half year. The profit made, after paying the dividend they were about to sanction, left £1952 to be added to the balance carried forward in the accounts for the previous half year, and brought up the balance in hand to £13,426. The increase in the consumption of gas had been most satisfactory—larger, he thought, than at any time since he had been connected with the Company. It amounted to 105,959,000 cubic feet, or 11·15 per cent., over the consumption in the corresponding period of last year. Moreover, they had received for gas an amount exceeding that of the corresponding half year by £5042. Coal had cost them £3478 more; and stokers' wages, £1029 more. So that, whereas the increased receipts for gas were, as he had said, £5042, the increased expenditure in coal and labour was only about £4500. The only unsatisfactory part of the working had been the low price received for sulphate of ammonia; the market being, he believed, at its lowest, or at all events, as low as he remembered it. Sulphate of ammonia realized only £7 16s. 2d. per ton during the half year; while in the corresponding half year, the Company received £8 6s. 4d. per ton. Notwithstanding that they had made more sulphate, it had left them with a loss of £15 14s. 4d., as compared with what they received in the corresponding half year. The Company's reserve fund now stood at its maximum—£86,192. The quality of the gas had been well maintained. The 926 tests which had been made showed an average quality of 17·71 candles; the standard quality being 16·50 candles. The sale of gas fires and stoves for various purposes had been very considerable; but he did not think that the gas consumption by fires and stoves had been as great as in other towns. The number of cooking-stoves out on hire had considerably increased. Other fires and stoves they sold outright; but cooking-stoves, being more costly articles, they let on hire, and they had had a demand for 58 additional ones. The progress of the works at Grimesthorpe was, he thought, satisfactory. The plans had been made by their Engineer (Mr. Fletcher W. Stevenson), and approved by Mr. George Livesey; so that the Directors had no fear that, when they began to make gas there, the works would not be all they could desire. The new works when completed would very largely increase the Company's powers of production. The contracts that were finished and in progress amounted to £92,976; and towards this sum they had already paid £53,000. There were, however, further contracts to make which would amount to about £44,000; and before they could produce gas at the works, they would have to pay a further sum of about £80,000. From these figures they would understand what a large amount of new capital they would require. It had often surprised him that gas-engines had not been employed more frequently, and come in use more rapidly, than had actually been the case in Sheffield; for Sheffield had so many industries that required a small amount of power, that he would have supposed the advantages gas-engines offered would have brought the Company a much larger consumption than they had yet experienced. In the past year they had, however, made sufficient progress. Twelve months ago the gas-engines in Sheffield had consumed 66 million cubic feet in the year; and during the last year they had consumed 89 millions. Gas companies had received considerable help from the new burner which had been produced, and which he mentioned at the last half-yearly meeting—the Denayrouze burner; and this, he was glad to say, was being put into operation in one or more of the large steel-works in Sheffield. The light which it gave had been highly approved and appreciated by those who had introduced it, and it was economical. Incandescent lighting by gas was progressing, perhaps not quite so fast as he would like to see it. But at all events, it was a light that spoke for itself, and which would, he was quite sure, be appreciated by all who used it. The Welsbach burner was, in his opinion, undoubtedly one of the greatest aids to gas companies, and one of the most successful inventions that had been known for many years. Its influence throughout the country had been great; and it had advanced the consumption of gas wherever it had been introduced. The Manchester Corporation were increasing their use of it by lighting their main streets with it. They had tried the experiment in Mosley Street, and some adjoining thoroughfares; and the incandescent burners had proved so satisfactory that they had decided to place them in Market Street, Piccadilly, portions of London Road, Oxford Street, Portland Street, Oldham Street, and Deansgate. As the Manchester City Council possessed both the gas undertaking and the electric light, he thought they might be satisfied that their extension of this experiment with the Welsbach burner was a guarantee that the incandescent gas-light was going forward there; and he believed it would also do so in Sheffield. Some of the shareholders, no doubt, would have noticed the lamps that the Gas Company had been permitted to fit with the Welsbach burner, and would have come to the conclusion that they made a very efficient street light; and they might depend upon it that it was also economical. Their opponent, the electric light, had not always an easy time of it any more than the gas companies had. The "Journal of Gas Lighting" last June referred to the electric light at the Central Meat Market in Smithfield, and stated that the competition there with gas was so great that on Midsummer Day nearly 100 salesmen discontinued the electric light in favour of gas; electricity having been found too dear for these people to continue it. One subject further he wished to refer to; and that was the purification of the atmosphere. If any city or town needed that, none did more so than Sheffield. To outsiders approaching Sheffield by railway, the appearance of the city was such that they wondered how the inhabitants could live in such an atmosphere. Some one must be to blame. It was surprising to him that Sheffield people would put up with it, and that they were satisfied with the way in which the law in regard to smoke was administered in Sheffield. It needed those who administered it to be more firm and more decided, and to punish people who were found guilty of infringing the laws that had been made for the prevention of smoke. In London, the atmosphere this year had been freer from smoke than anyone remembered to have seen it before. He had occasionally inquired what was the cause, and had found some that said it was because there were so many more gas-fires used in London in proportion to its inhabitants than in other towns in the kingdom. He would be very glad if the Sheffield people would do their part in this way to lessen the production of smoke, and use more gas-fires than they now did. Not only would the Gas Company profit by such action, but the atmosphere would be greatly improved. At the last meeting he referred to the lighting of Edinburgh streets by electricity; and he saw that since that time the cost of lighting the streets had very greatly increased. In Edinburgh last year the city authorities paid £30,063 for lighting the streets; and the estimate for lighting during this year was £32,960. Ten years ago the city spent some £14,000 a year for lighting. When they considered how much greater was the extent of Sheffield than of Edinburgh, he thought they had cause to be satisfied that the Sheffield rates were not increased by an excessive amount being paid for public lighting. Should Sheffield adopt any other light than gas, he was afraid the ratepayers would find, as those of Edinburgh had done, that the cost of lighting the streets would double. He again advised the shareholders and others to be at some trouble and expense in regard to the burners they had in their houses and manufactories. It was worth while spending a little money, and having one's lighting arrangements overhauled at least once a year; for, let them depend upon it, he said, they would receive full value for the money paid, and they would be better satisfied with their expenditure for gas than if they neglected giving such attention as he recommended.

Mr. R. A. Hadfield seconded the motion.

Mr. John Wilson asked if there was any likelihood of a reduction in the price of gas being made. The last reduction seemed to have brought the Company more customers, and a larger income; and they had no occasion to be afraid of the electric light at present, nor did he think they ever would. In his opinion, there was room for both. He hoped the Company would soon be able to reduce the price of gas.

The Chairman, in reply, said they were all interested in reducing the price of gas if the Company could afford it. But in April last year, the Company made a reduction of 2d. per 1000 cubic feet; and they had hardly got over that yet. The subject of a further reduction had therefore never been before the Board. It should be borne in mind that the Company were now spending largely without getting any income from the expenditure; and that this would continue to be the case until they began to make gas at Grimesthorpe, which they did not expect to be in a position to do until December of next year. Consequently, they must defer entertaining the idea of a reduction, interesting as the subject was no doubt to the inhabitants generally.

The motion was then carried unanimously.

The dividends proposed by the Directors to be paid on the various classes of stock having been sanctioned,

The Chairman moved the following resolution: "That the £20,155, Class D, £6 fully-paid shares, being part of the capital authorized to be raised by the Sheffield Gas Act of 1866, be as from this day converted or consolidated into Class C stock, and that such stock be divided amongst the holders of the said Class D shares according to their respective interests therein, and that the consent and authority of the shareholders present at this meeting be, and the same is, given to such conversion or consolidation, and to all acts necessary for that purpose." He said he did not think it needed any remark from him to recommend the proposed change. It was intended to facilitate the business of the Accountant, and except for that no benefit or disadvantage would result from it either one way or the other.

Mr. Wilson Mappin seconded the resolution; and it was adopted without discussion.

The retiring Directors (Mr. W. G. Blake, Mr. R. A. Hadfield, and Mr. H. K. Stephenson) were all re-elected.

On the motion of Mr. John Wilson seconded by Mr. A. J. Hobson, a vote of thanks was accorded to Sir F. T. Mappin for his services in the chair.

The Chairman, in acknowledging the vote, said he took it as including all the other Directors and the officials of the Company. It was a pleasure to him to fill the post of Chairman of the Company, and to see such success and prosperity. He saw no cause to fear any falling off in success; and he thought that, if their business was properly managed, it would be able to meet all its competitors, and that its life would be prolonged. He would not venture to predict how long; at any rate, he thought they might all have every confidence as to the money they had invested in the Company.

The proceedings then ended.

BRADFORD CORPORATION GAS SUPPLY.

The Half-Year's Working Results.

At the Meeting of the Bradford City Council last Tuesday—the Mayor (Mr. Thomas Speight), who is also Chairman of the Gas and Electricity Committee, presented the report for the six months to June. He said that during the half year 64,477 tons of coal and 13,864 tons of cannel were used; and 819,222,000 cubic feet of gas, 31,683 tons of coke (for sale), 5084 tons of tar, and 11,521 tons of ammoniacal liquor were produced. The coal and cannel cost £39,912, or £360 more than in the corresponding half of 1896; purification cost £1409, or £129 more; salaries cost £560, or £46 more; and stokers' wages, £10,391, or £20 more. The repairs to works cost £4864, or £1972 more than in the corresponding half of last year—due to the renewal of the condensing and scrubbing plant at the Thornton Road works being charged entirely to revenue. Repairs of retorts cost £2566, or £401 less. Repairs to mains, meters, and services cost £2210, or £220 more than in the corresponding half of 1896; and inspection of meters, £1284, or £65 more. Cartage and yard labour cost £2112; being £227 more than in the corresponding half of last year. New lamps, lighting, and repairs cost £4812, which sum was an increase of £1165, and was due to the extension of the system of incandescent lighting. Part of this cost, however, was compensated for by the reduction in the amount of gas consumed in the lamps; and by the end of the year all the new fittings

would have been paid for by the saving of gas which was occasioned by the system, in addition to the advantage of the increased illumination given by the incandescent lamps. The salaries of clerks cost £805; collection, £250; stationery, £147; rates and taxes, £3011; gas and water, £1499—all of which figures were practically the same as last year. Gas-stoves cost £921, or £143 more; and bad debts and abatements accounted for £345, or £5 more. The total expenditure amounted to £77,105, or £4084 more than in the corresponding half of 1896. The receipts for gas sold were £76,578, or £2983 more than in the corresponding half of last year. The rental of meters was £322, or £11 less. Coke brought £8075, or £743 more; and tar, £6570, or £1197 more. Both the returns for tar and coke were very satisfactory; but, unfortunately, the price of tar had fallen considerably since the last contract was made, and it would not yield as much during the current year. Spent oxide produced £632, being £96 less; and ammoniacal liquor and chemicals, £5929, or £140 more than last year. Stoves produced £917, or £81 more; meters, £214, or £41 less; and sundries, £815, or £239 more. The total revenue for the half year was £100,057; being £5234 more than in the June half of last year. The gross profit was £22,952, or £1150 more than in 1896. Of this, interest on loans required £8627, or £516 less than last year; and the sinking fund, £4250—the same as last year. Bank interest was £115, or £146 less; and income-tax was £929, or £51 more. These items left a balance as the net profit upon the half-year's working of £9327, or £1778 more than in the corresponding half of 1896, and £4354 more than in the last half of 1896. If the cost of the street lighting was paid for by a special rate (as was the case in most other towns), the profits would have amounted to upwards of £21,000 for the half year. The amount of gas unaccounted for was 3·74 per cent., as compared with 4·79 per cent. in the corresponding half year. This was always an item in these reports; for there was necessarily some leakage and some condensation in the mains. Since other large towns were making less profit instead of more, he thought the Corporation of Bradford might congratulate themselves upon their most satisfactory position. In conclusion, the Mayor said many people seemed to be afraid that the increase in the electricity supply in the town would mean a decrease in the amount of gas required. This was not the case, however, as was shown in the past half year; and it would be generally found that, as the electricity supply extended, it would not interfere with the gas supply. The minutes were adopted.

HALIFAX CORPORATION GAS SUPPLY.

The Projected Application to Parliament for Further Powers.

Last week (p. 601) a brief notice was given of the previous Wednesday's proceedings in the Halifax Town Council, when it was agreed to introduce a Bill in Parliament next session for a large extension of the Corporation's powers of borrowing for gas-works extension purposes. We are now able to give further particulars as to the proposal.

The recommendation of the Gas Committee was: "That power be obtained in the next Bill promoted by the Corporation for the following purposes: (1) To utilize the land already possessed by the Gas Department in Charlestown Road, and a piece adjacent thereto, for the manufacture of gas. (2) To utilize land at Whitegate, adjacent to the existing gasholders, which land the Health Committee are prepared to hand over to the Gas-Works Department. (3) To increase the borrowing powers for gas-works purposes by the sum of £250,000. (4) That the following clause be inserted in the Bill—viz., 'All pipes and other fittings required for distributing or consuming gas within any building or from the outlet of any meter, shall be approved of by, and affixed to the satisfaction of, the Corporation or their Gas Engineer before the owner or occupier of such building shall be entitled to a supply of gas; and the Corporation may make such regulations as they think fit for the supply of gas through ordinary or prepayment meters, and for securing the proper laying of outlet-pipes, and the proper fixing of gas fittings or apparatus.' (5) To empower the Corporation to sell or let on hire electric motors, arc lamps, and other appliances."

Alderman Woodhead, in moving the adoption of the resolution, observed that an erroneous impression had got abroad that they were going to apply the £250,000 mentioned above possibly within the next few months. As a matter of fact, however, the Committee calculated that the money would see them over some fifteen years. In 1892 the Corporation obtained borrowing powers for £100,000, of which £17,000 had then already been spent. They had since expended £72,000; leaving between £9000 and £10,000 of their borrowing powers still unspent. This was proof that they did not rush in to spend money as soon as they got the power. They must, however, be prepared to meet the growing demand there was for gas. To give the Council some idea of the rate of progress going on at the gas-works, he stated that in the year 1882 the gas sold was 320 million cubic feet. For the year ending March 31 last, the quantity sold was 684 millions; showing an increase in 14¼ years of 114 per cent. The increase for the previous 15 years was about 100 per cent. He could, therefore, fairly claim that the consumption of gas was growing at an accelerated pace. The amount of capital employed per million cubic feet of gas manufactured in 1882, was £724; and for the year ended March last, it was only £467. On Dec. 31, 1882, their gross capital was £259,449; and on March 31 last, it was £415,296—an increase during the 14¼ years equal to 60 per cent. If they only increased their capital by 60 per cent., and their output of gas by 114 per cent., they would require the whole of the £250,000 now in question in 15 years from now. While their output of gas had more than doubled during the last 15 years, their capital account had only increased by about half; and they had a large stock of meters paid for that were not yet in use. The amount paid to the sinking fund in 1882 was £2598, or £1 in £90. Last year, however, they repaid £7670, equal to £1 in £42. This, he thought, would demonstrate to the Council that the Gas Committee were proceeding on sound business and financial lines. A question might arise as to whether the increase in the output of gas would continue. The Committee had every reason to believe that it would; because during the last few months (from April 1 to Sept. 5), the increase had been quite abnormal. They had had a growth during this short period of just over 9 per cent. If the increase continued, they would have to make special provision for it; and they could not possibly cope with such a large increase in their output without enlarging their working plant. They had large extensions in progress; and within the next three years £100,000 would be required for the gas-works. Of this £40,000 would go for a new holder. The Council were aware that, during the last year, they were in the serious difficulty that they were not able to supply the quantity of gas required. Such a state of things they ought, as business men, to remedy as speedily as possible. In addition to the new holder, they were putting down a new water-gas plant, which they estimated would cost £10,000. In preparing for these things, a considerable amount of money had already been expended. When, however, they had been completed, there would be several years following when very little expenditure would be required; because they would then be able to supply, he thought, something more than the maximum demand—they would be able to supply considerably over 5 million cubic feet of gas per day. The carrying out of their present programme would necessitate the demolition of the old end of the gas-works. They were carbonizing there about 20,000 tons of coal per annum; and with the up-to-date plant which would be substituted, they would save on this work 3s. 6d. per ton, or a total saving of £4375 per annum. The Gas Committee had £5800 in reserve, which they were using to pay off the sum of money still unredeemed by the sinking fund on the building they should pull down; and they were hoping that another year, in addition to relieving the rates considerably, they would be able to appropriate a similar sum to the reserve fund. They would then not be far short of extinguishing the amount of debt existing on the buildings at the old end. In asking for this £250,000, the Gas Committee wanted it to be clearly understood that they were providing for the future. They had over and over again, however, been advised by the Local Government Board to anticipate their wants, and not to be going before them every few years. Their property, taking all things into consideration, was worth considerably more than it was reckoned at.

Alderman Brook, seconding the resolution, mentioned that the old end of the gas-works, which was erected in 1856, was not only worn out, but obsolete in every direction.

Mr. Raper moved, as an amendment, that the extended borrowing powers obtained be for £100,000 only. He did not anticipate that any great amount of capital expenditure would be required after the next three years. If, however, £20,000 or £50,000 more was needed, they could apply for it when it was required. The time, he thought, had arrived when, not only the Gas Committee, but every Committee of the Corporation should hold their hands.

Mr. Fawcett, seconding the amendment, denied that it was right to pledge future members for 15 years to come.

Mr. Bottomley suggested that they should adopt a middle course, and ask for an extension of borrowing powers by £150,000.

The Town Clerk advised the Council to agree to this. It was not usual, he said, to look forward for gas purposes for 15 years—10 years was the limit. At the same time, it was better not to be too modest in their application, as they had been advised by the Local Government Board to increase their estimates rather than be bothering them every few years.

The resolution of the Committee, with the substitution of £150,000 for £250,000, was then agreed to.

CARLISLE CORPORATION GAS AND WATER DEPARTMENTS.

The Annual Reports and Accounts.

At the Meeting of the Carlisle City Council last Tuesday, the Gas and Water Committee presented their annual report and accounts, together with the report of the Engineer (Mr. C. B. Newton), all of which have been noticed in previous issues of the "Journal" (*ante*, pp. 541, 601).

Mr. Corbett, proposing the adoption of the reports, said it was with much pleasure he was able to announce that the gross profits from the gas amounted to £9963, which, after deductions for income-tax and other charges, left £9098 to hand over to the city fund. After the redemption and payment of loans, there was a net balance of £5757 available for the relief of the rates. The consumption of gas during the year showed an increase of nearly 6 per cent.; and the revenue from the sale of gas had increased by £1848. The revenue from residuals had been very satisfactory, showing an increase under each head. An alteration had been made in the sulphate of ammonia plant, which would enable them to produce the commodity to the best advantage; but the market for it, he was sorry to say, was very depressed. The contracts for coal showed a little advance on the prices paid last year. The Committee now felt the time had arrived when an extension of the works must be taken in hand; and they had accordingly instructed Mr. Newton to report and submit plans, if necessary, for erecting buildings and laying down gas plant on Boustead's Grassing. This would, of course, come before the Council in due time. Passing to the water accounts, he said the quantity of water supplied during the year was close upon 19 million gallons more; and the revenue exhibited a gratifying increase. The receipts were £575 more than last year; and the sum paid into the district fund amounted to £5558, which, after payments on account of loans and interest, left a net profit of £3069. The revenue from the rentals for water for domestic purposes would, of course, increase as the sale extended; but the bulk of the increase of the year came under the head of trade purposes. The combined net profits of the gas and water department were £1652 more, which, he thought all would agree, was very satisfactory. This result was in a great measure due to the able and practical management of Mr. Newton.

Mr. Coulthard, in seconding the motion, said that altogether the accounts were very satisfactory. The revenue from the bye-products varied considerably; and this was one reason why they should not reduce the price of gas, because they did not know when the revenue would run down, and leave them nothing to fall back upon. In October, 1888, the price was reduced by 3d. per 1000 cubic feet, causing on the sale at that time a diminution in the profit to the extent of £2175. The gas now produced showed an increase of 88,623,000 feet over the make of 1888. The rental then was £21,753, and the bye-products yielded £3691, as against £30,435 for rental in 1897 and £7118 for bye-products—showing an increase in rentals of £8681 and in bye-products of £3426. What

he would suggest was that the Committee should abolish meter-rents, and let out cookers free of cost. The meter-rental amounted to £880 a year, and Mr. Newton told him that the revenue from cookers was £200; so that the loss would only be £1000 altogether.

Mr. COLLIN considered that the still increasing trade in gas and water indicated that the time had come, notwithstanding the remarks that had been made, when the public should get their gas at the lowest possible price, leaving, however, a good margin for contingencies.

Mr. RITSON thought the Engineer deserved great credit for having made the works so profitable. He was glad Mr. Coulthard had brought forward the suggestion as to the abolition of meter-rents.

Mr. FRENCH urged that the gas consumers should now derive some benefit from the prosperity of the works. The profit of £10,000 might be very satisfactory from a ratepayer's point of view; but he doubted whether it was so to the consumer. He thought the Gas Committee should consider the advisability of reducing the price of gas or abolishing the charges on meters.

Mr. TWEEDY pointed out that the Gas Committee got little, if any, profit from meter-rents, as the revenue from them had to meet the expenditure in fixing and keeping them in repair.

The MAYOR (Mr. W. I. R. Crowder) remarked that the reports were very satisfactory; and great credit was due to Mr. Newton and the Chairman of the Committee for the way in which they had discharged their duties.

The reports were adopted.

TWO DEATHS FROM COAL GAS POISONING.

Leakage from a Fractured Main.

Early yesterday week, it was discovered at Leeds that two maiden ladies, aged 62 and 68, had been suffocated by coal gas—not water gas this time—in their house during the previous night, under circumstances detailed at the Coroner's inquest held last Wednesday.

The proceedings at the inquest commenced with the evidence of the doctor who was called in as soon as the accident was discovered. He described the results of a *post-mortem* examination he had made of the bodies. He found the complexion of one of the ladies to be cherry coloured, while the other one's countenance was pallid. The remaining appearances were identical, and he came to the conclusion that death was due to the inhalation of coal gas. He attributed the difference in the complexion of the deceased to the fact that one of the sisters had been roused from her sleep, and got out of bed. In her struggle to reach the window, she would inhale more gas than her sister, who died in her sleep. In reply to further questions, the doctor said that death would probably take place about an hour or an hour and a half after the inlet of gas into the house, depending upon the size of the inlet. Asked whether, if an entrance had been effected earlier in the morning, the lives of the deceased might have been saved, witness said that if either of the deceased was sufficiently conscious to get out of bed and obtain a quantity of fresh air, her life might possibly have been saved.

Other witnesses were called, who proved that on the Sunday evening the deceased ladies were in their usual health. When a niece called to see them on Monday morning, however, she found the blinds drawn and the door fastened. A milkman gained an entrance through a window, and found the old ladies dead in their bedroom. One of them was lying on the bed, as though she had died in her sleep; the other was lying on the floor, as though she had been struggling to reach the window. A boot was in one hand, and the other boot was underneath her.

A next-door neighbour, Mrs. Foster, said that soon after twelve o'clock on the Sunday night she and her husband noticed a muffled sound apparently under the bedroom floor, followed by a strong escape of gas. They went downstairs, and opened the doors and windows; and about two o'clock in the morning they called the attention of a police-constable to the smell of gas, and asked him to examine the place. At the request of her husband, the officer afterwards went to the door of the house occupied by the deceased, and knocked loudly with his staff, but there was no reply. Witness then said she thought there would be no one in the house, as the ladies sometimes slept away. If she had had any suspicion that the deceased were in the house, of course, she would have insisted upon the constable entering the house. Witness added that there was a flagstone which had sunk slightly inside her door; but it had not sunk recently, and no heavy weights had been taken over the flags near the house that she knew of.

The police-constable referred to said his attention was called to the escape of gas by the last witness at two o'clock in the morning. He found a strong smell of gas near the cellar-gratings of the houses. The last witness told him that the occupants of the next-door house were away. To make sure, he knocked four or five times on the door heavily, but got no answer. He went into the street and looked at the windows, but saw no sign of anyone moving inside. He knocked again; but hearing no sound inside, he concluded that there was no one in the house. He reported the matter at the police-station.

The course of the report by the last witness was traced by evidence, which showed that at three o'clock in the morning it was received by a fitter in the employ of the Corporation, who was instructed to visit the place. He was off duty sick at the time, and did not do so until seven o'clock, when he reported the matter to the authorities at Meadow Lane Gas-Works. Subsequently a setter-up of gas-mains in the employ of the Corporation was sent to the place, and found a 3-inch main fractured. The flagstones above the fractured pipe had sunk, and the ground was hollow under the pipe. The pipe was broken clean in two. It had apparently been properly laid. The fracture was 3 ft. 4 in. from the deceaseds' house. The ground had settled 5 or 6 inches in the drain; and the pipe was broken clean in two.

A registered plumber who had been directed by the Coroner to inquire into the circumstances attending the disaster, described the results of his examination. He said the broken pipe had given way in consequence of the subsidence of the adjoining ground. After the breakage, the gas would percolate through the soil, which was ashes and sand, and would probably enter the house through the place in the wall left for the entrance of the service-pipe. The pipe was properly laid in every way, except that the hole in the wall might have been filled by brick and lime. Such work was, however, often left undone. As a practical man, he could not attribute blame to anyone for the accident, except for the slight omission to fill up the hole through which the service passed.

In summing up, the Coroner remarked that there was no doubt as to the cause of death, nor as to the cause of the accident. The only question was as to whether anyone was to blame; and if so, who? In his opinion, the accident was unavoidable; and no one was to blame.

The Jury considered their verdict for five minutes, and then declared that "Death was caused by the inhalation of coal gas from a fracture of the main, and that it was purely accidental."

UTILIZING THE WASTE HEAT OF GAS-LAMPS.

In the notice which we gave in June last of the exhibits in the Gas Section of the Victorian Exhibition at the Crystal Palace, a short reference was made to the apparatus which has been introduced by the Pluto Hot-Water Syndicate, and which has for its object the supply of hot water by the utilization of the heat emitted by the flames of gas-lamps. The time was not then opportune for the publication of a description of the arrangement; but we are now in a position to give a general idea of its construction, together with an illustration of a street-lamp in which the device is embodied.

The transference of the heat from the top of the lamp to the bottom is accomplished simply and automatically. Cold water is fed into a spiral coil and a superheating chamber, placed about a foot above the flame. The water is converted by the heat of the gas into steam, which is expelled by its own expansive force through an ordinary dead-weight safety-valve down a pipe to the base of the column, where it heats water in a reservoir by means of an iron coil, so that the steam does not actually come in contact with the water, which is supplied to the public by a very simple halfpenny-in-the-slot device, in quantities of one gallon. By the action of an ordinary water-pressure reducing-valve in the supply-pipe, a fresh supply of cold water from the main at a uniform pressure is fed into the heating-coil, each time the steam forces itself out through the safety-valve. The reduction of pressure caused in the coil by the emission of the steam automatically allows an amount of water to pass into the coil exactly equivalent to the steam expelled therefrom; and this automatic pulsatory action is constantly maintained till the water in the cistern at the base of the lamp is all boiling. Freedom from accident in working is secured by the presence of the safety-valve, and the absence of any space in which steam can accumulate, even if cold water is forced through the coil when red hot.

The Syndicate claim for their apparatus a wide field of usefulness. They say it is applicable to private houses, factories, depôts, stables, the bracket lamps of public houses, and, indeed, wherever gas is used for lighting and it is desired to use the waste heat. The steam obtained is just as useful for heating radiators for warming buildings, for steam cooking purposes, running small domestic motors, and for heating water for baths, domestic, and trade purposes. As an illustration of what could be accomplished, they point to the enormous amount of heat which is wasted in the street-lamps of London alone, which heat, they maintain, can now be utilized for a public supply of hot water without interfering with the light of the lamps, and with such efficiency that, if only one-tenth of the lamps were fitted with their apparatus, a total of 120 million gallons of boiling water per annum could be supplied at ½d. per gallon through a slot machine. The Syndicate believe there is a demand for a hot-water supply; and they state that the authorities of Liverpool, Nottingham, and St. Martin's-in-the-Fields, London, have already granted licences for the erection of the apparatus in consideration of having half the gas bill for the street-lamps used paid by the Syndicate. The one on view at the Crystal

Palace has been in constant use since we first called attention to it, without, we are informed, needing any repair or regulation; and as many as 125 halfpennies have been taken in one day from stall assistants and inquiring visitors.

ELECTRIC LIGHTING NOTES.

The Batley and Stoke-on-Trent Town Councils last Thursday decided to apply for Provisional Orders, to authorize them to supply electricity for public and private purposes. In both cases, the gas-works are Corporation property.

The Electric Light Committee of the Liverpool City Council have received a communication from the Local Government Board sanctioning the borrowing of £56,000; being part of the sum of £100,000 needed by the Corporation for electric lighting purposes.

The Newport (Mon.) County Council have obtained a loan of £30,000 or £35,000 for the extension of the electrical installation in the borough; and a report, embracing twelve foolscap pages, was presented at last Tuesday's meeting, showing the way the money is being applied. Some contracts have been entered into for new buildings, at a cost of £6400; and for plant, at £9854.

A special meeting of the Leamington Town Council last week was called to consider a proposal to apply to the Board of Trade for a Provisional Order for electric lighting. In the course of the proceedings, one councillor said that the present Electric Lighting Company had put down their mains without obtaining a Provisional Order. He complained that the electric light supplied by the Company cost twice as much as gas; and he alleged that many of their cables were in a rotten condition. The cost of a Provisional Order, the Town Clerk said, would not be more than £500. The resolution was carried *nem. con.*

At the meeting of the Shrewsbury Town Council yesterday week, the Finance and General Purposes Committee intimated that they had considered a report by Messrs. Kincaid, Waller, and Manville, the Electrical Engineers who had been called in to report upon the Shropshire Electric Light and Power Company's works; and they recommended the Council to negotiate for a purchase, and proceed to get the necessary power by Provisional Order. Mr. T. P. Deakin, who proposed the adoption of the report, said the net value of the undertaking was reported to be £14,580, without goodwill; and its value would increase yearly. The motion was adopted; and the Town Clerk was instructed to take the necessary steps in the matter.

At a meeting of the Gas and Electric Lighting Committee of the Wigan Corporation, held last Wednesday, the Town Clerk read a letter from Messrs. Crompton and Co., asking if the Corporation would be prepared to transfer their Provisional Order to the Electrical Supply Corporation. A notice was also read from the Imperial Electric Light and Power Company, of their intention to apply for a Provisional Order for the electric lighting of the district. It was resolved that, having considered both communications, the Committee cannot recommend the Council to entertain any proposal for a transfer of the Electric Lighting Order; and that the subject of electric lighting is receiving the careful consideration of the Committee, who at the proper time will be prepared to submit to the Council proposals with regard to the intended installation.

Some time since (in March, in fact), the St. Pancras Vestry sanctioned the invitation of tenders for the supply of two large engines and dynamos, &c., for their Regent's Park station, at an estimated cost of £11,600; but the Electric Lighting Committee have just discovered that there is no room for the new machinery when purchased. On Wednesday, therefore, the Electricity Committee recommended, and the Vestry sanctioned, the employment of "an architectural draughtsman for a period of three months, at a salary not exceeding five guineas a week—£60 in all—"for the purpose of preparing plans and details for the extension of the station." These plans will have to be submitted to the London County Council before the work can be commenced; so whether the machinery—evidently needed in March last—will be used during the coming winter, is more than problematical.

According to the "Electrical Review," the state of electric lighting affairs at Colwyn Bay has come to a noteworthy pass; and an error has been committed by the District Council, which if that body were well advised they would lose no time remedying. A proposal was made that a certain firm should be appointed Consulting and Electrical Engineers to the Council. An amendment was moved deferring the question. The voting was: For the original motion, 4; for the amendment, 4 (including one Director of the Gas Company). The Chairman gave his casting vote for the amendment; and, our contemporary remarks, "everything said about the injustice of the gas director voting against a rival illuminant had no effect with the Chairman, who, in response to a member who disputed his ruling, replied: 'I do not care what you think; Mr. Porter is returned here to vote, and it is not for me to rule his vote good or bad.'"

The engineers' strike is immediately responsible for a notice by the Sheffield Electric Light Company of their inability to accept any more customers at present. Early this year, the Directors had reason to anticipate a good growth in the demand for electricity; and orders were placed for engines and dynamos equal to 2000-horse power. There was then no indication of trouble in the labour market; and delivery of the machinery was guaranteed by the end of this month. Now, however, disjointed parts of the machines are lying about in the various workshops in an unfinished condition; and the date of completion cannot even be guessed at until the strike is at an end. The demand upon the Company for electric light has increased by 100 per cent. since this time last year; and consequently the Directors of the Company have decided to refuse further orders, so as not to jeopardize the supply of current to their existing customers. It is said that they intend to introduce American and Continental machinery next year, so as to render impossible in future the dislocation of their business by causes similar to those now existing.

The report of the Bradford Corporation Electricity Department for the six months to June last shows that the income was £8736, compared with £6937 in the corresponding period of the previous year, or an increase of £1789. The expenditure for the half year, which included interest and sinking fund, was £7061, against £5929 for the corresponding period of 1896. The profit for the half year was therefore £1665, as against £1007. The number of consumers was at present 521—an increase upon the corresponding half year of 33½ per cent. The total units consumed was 443,288, against 336,281, or an increase of 31¾ per cent. The total profits since the opening of the works in September, 1889, after paying interest and sinking fund, amounted to £13,833; and the total amount written off for depreciation had been £4622. This left £9211 to be appropriated as the Council might direct. The trade profit—that was the profit before charging interest and sinking fund—was £3 18s. 5d. per cent. for the half year on the outlay. The net profit, after charging interest and sinking fund, showed £1 6s. 5d. per cent. for the half year.

At last week's meeting of the Wolverhampton Town Council, the Lighting Committee presented a report recommending the making of a differential charge for the supply of electrical energy. The present rate of 6d. per unit is to be retained; but customers consuming electrical energy above the "maximum demand" standard of two hours daily, would be charged at the rate of 3d. per unit for the excess. Alderman Mander explained that the heavy demand for energy during a few hours only each evening placed a strain on the resources of the undertaking, and an expense out of proportion to the amount charged. It was proposed to offer the current at 3d., so as to encourage long-period consumption, as against heavy consumption within narrow limits of time. The recommendations included the expenditure of £370 for the purchase of the "demand indicators." In reply to a member who wanted a cheaper rate of supply for churches and chapels, Alderman Mander remarked, amid laughter, that if the questioner would arrange for plenty of Bible classes during the week nights, and keep them going four or five hours, the Committee might do something towards a reduction. The recommendation was agreed to.

The Brighton Corporation electricity undertaking continues to progress. There have never been so many new applications for the supply of the illuminant as this year, as shown by the fact that up to the present they number 222, as compared with 204 in 1896, 132 in 1895, 128 in 1894, 122 in 1893, and 74 in 1892. This is doubtless due to the low price at which electricity is being supplied in Brighton. It is lower this year than in any other town in the United Kingdom—the average working out at under 3½d. a unit. In view of the near approach of the busy season, the Manager (Mr. Arthur Wright) has had the plant at the electricity station thoroughly overhauled; and extensive preparations are in progress for the installation of new machinery and boilers. The chief additions to the plant will be three very powerful water-tube boilers capable of steaming for more than 500-horse power each, two steam-engines of 800-horse power, and a large condensing plant for use in connection with them. Their installation has already commenced. Provided the present rate of progress does not diminish, it is computed that at the end of the year 2 million units will have been sold, and probably over 1700 ratepayers will be users of the light. No other town, it is said, can boast of such a private supply as Brighton, which numbers something like 600 private houses among the customers.

The Coventry Electric Lighting Committee have succeeded in passing through the City Council their modified scheme of extension. As mentioned last week, the street-lighting proposals contained in their original report were dropped, as was also the expenditure on mains; the cost of the scheme being thereby reduced from £37,900 to £31,000. Alderman Hill assured the Council that it was with great regret the Committee had made the reductions. If at any time street lighting was decided upon, the roads would have to come up once more; and for this the Council would have to take the responsibility. He intimated that other arrangements would shortly have to be made in regard to the appointment of Mr. R. Hammond as Consulting Electrical Engineer, though it was essential the Committee should have an adviser, as had the General Works and the Water Committees. Alderman Hill disputed any assertion that the increased use of the electric light would interfere with the gas consumption in the city. The Gas Department had an inherited business, with a capital of some £200,000, and yet it did not pay in the first year it was taken over. The adoption of the report being seconded, Alderman Andrews desired to know what was the amount of capital to be spent on the eight sub-stations, and was informed that it was £7750. Mr. West held that the city required electric lighting, and trusted "the undertaking would not be starved." Mr. Lee said he had hoped the proposed expenditure would have been reduced by about £20,000. He moved, as an amendment, that the matter be referred back, and the Committee be requested to bring forward another scheme, with an expenditure not exceeding the sum he had named. While hardly coinciding with it, Mr. Band seconded the amendment. Alderman Andrews asked if the Council were prepared to pay £3000 to £4000 a year for public lighting, in addition to the sum paid for gas. Eventually the report was adopted by a considerable majority.

The Directors' report of the Brush Electrical Engineering Company, Limited, for the year ended June 30 states that the profit and loss account shows an available gross profit of £43,761. After deducting maintenance, general charges, and interest on debenture stock, there remains a balance of net profit of £18,962, which the Directors recommend should be applied as follows: Balance of dividend due to preference shareholders for the year ended June, 1895, £2141; dividend at 4 per cent. per annum on preference shares for year 1896-97, £7200; bonus payable to employés under profit-sharing scheme, £1609; reserve fund, £5000; balance carried forward, £3011. The results of the year's working show a decided improvement over those of the previous year. Further administrative economies have been, and are being, effected, of which the accounts for the past year have not derived the full benefit. Formal sanction to the reduction of the ordinary share capital authorized by the shareholders last November having been obtained, the balance-sheet is drawn in accordance with the reduced valuation of assets approved by the Court. Of the £76,770 of 4½ per cent. redeemable second debenture stock, the Directors have decided to pay off £26,770 on Oct. 1. There will then be a sum of £50,000 second debenture stock outstanding. Capital expenditure to the extent of £11,348 has been incurred during the year on extensions of buildings and plant at Loughborough; and further additions are now in progress. The Directors "consider this capital outlay justified by the large volume of orders now in hand, and the improving prospects of the Company's trade. The Company's works have been employed during the past year in the manufacture of electric lighting and traction plant, consisting of steam engines, alternating and direct current dynamos, and accessories; also of locomotives, cars, and

other rolling stock. In the field of electric traction, the Company have secured important contracts, which are now in progress." The result of the year's operations enables a further distribution to be made to the employees under the Company's profit-sharing scheme, the scope of which was extended in 1893 to include the Company's workmen. Since then the sum of £4753 has been distributed in cash or invested in the provident fund. In the opinion of the Board the scheme continues to work well in the interests both of shareholders and participants.

NOTTINGHAM CORPORATION WATER UNDERTAKING.

The New Parliamentary Powers—Reports on the Accounts.

The efforts which have been made at Nottingham to obtain powers for constructing additional water-works were the subject of a report presented by the Water Committee to the City Council yesterday week. The Bill which was promoted last session, it will be remembered, was considerably modified in its passage through Parliament; but nevertheless the Committee were of opinion that, under all the circumstances, the Council might be congratulated upon obtaining very valuable powers for the establishment of a pumping-station in a district practically untouched, and from which they believe an abundant supply of water would be derived for many years to come. On their recommendation, the Council agreed to authorize the Committee to carry out the powers conferred by the Act.

The Council also had before them the reports of the Elective Auditors (Messrs. Gath and Mellers) on the accounts of the department for the past financial year. Mr. Gath stated that the receipts on revenue account were £71,660; being an increase of £2525. The expenditure was £67,528; being an increase of £273. The net profit, after deducting payments for interest on capital and proportions of sinking and depreciation funds, was £4131; being an increase of £2252. There had been a further expenditure of capital amounting to £3265; bringing the total outlay up to £710,833. Mr. Mellers reports that the total income from water-rents and other sources amounted to £71,660 for the year; being an increase of £1313. The arrears, though rather larger than last year, were fairly distributed in small amounts over all the districts. The expenditure side of the accounts, he said, disclosed some unusual payments, which had placed the finances of the department in an unsatisfactory condition, and precluded the possibility of any contribution towards the relief of the rates. The payments for parochial rates and taxes amounted to £5593, against £5070 in the previous year; the increase being caused principally by the higher School Board rates. After devoting £5256 to the sinking and depreciation renewal funds, there remained a profit of £4131, which had been transferred to the new additional works account. This was the second year this course had been adopted—making a total of £6475 for the two years; and this was the least satisfactory part of the accounts. Of this sum, £2998 had actually been expended up to Lady-day last. The balance (supposed to be in hand) of the additional works (special) account was £3477, and was retained to meet liabilities for parliamentary proceedings and expenses of trial works. He remarked that the enormous expenditure involved indicated the necessity for some national arrangement over the water supply of the country.

ROCHDALE WATER SUPPLY.

Reported Purchase of the Todmorden Water Company's Works.

For some time the Water-Works Committee of the Rochdale Town Council have (says the "Rochdale Observer") been exercised in their minds as to the necessity for making greater provision than now exists for supplying the town with water. The period during which it was originally estimated that the present supply would adequately serve the town has long since expired; the development of the borough not having been so rapid as was anticipated. But despite this fact, the Water Committee now find it absolutely necessary to consider the town's position, as even if the increase of the population during the next few years is no greater than it has been recently, the supply will become insufficient within the next decade. The members of the Committee, wishing to avoid any step that might not accord with the desires of the other members of the Town Council, consulted the General Purposes Committee on the matter; and it was then decided that there should be a meeting of the whole Council in committee, in order that the position of affairs might be fully explained, and an expression of opinion taken. This meeting of the Council was held on Monday, the 6th inst.—the Mayor presiding. The circumstances of the case were fully explained; and it was then decided to call in an expert to advise the Water Committee on certain points—viz., as to how long the present supply is likely to prove sufficient for the town; as to what extent the supply can be increased by the pumping of water from pits which are not now being used; and as to the value of the Todmorden Water-Works, which have been offered to the Rochdale Committee. It had been currently reported that the Rochdale Corporation had purchased these works; but this statement is not true. The matter has been discussed; but until the report of the Engineer whom it has been decided to call in has been presented, no definite action will be taken in relation to it. Negotiations have been carried on, however; and a price has been named.

At a subsequent Rochdale Ward Meeting, Mr. Councillor Sharp made extended allusion to the matter of the future water supply of the town. He said as the inhabitants were all aware the Corporation had six important reservoirs, large and small. Three of them were purchased from the old Water Company, at a cost of £74,000; and since then the Corporation had made three other reservoirs—viz., Cowm, which cost £287,000; Spring Mill, which cost £260,000; and a little reservoir at Knot Hill, which cost £4000. The Corporation had besides spent £92,000 on water-mains. Altogether they had expended £717,000 on the water supply of not only Rochdale but also Littleborough, Milnrow, Newhey, and Castleton—some 100,000 people in all. They had reservoir accommodation for 180 days. The Corporation were continually having fresh customers for their water; and since March this year the Committee had put down, or given power to lay, no less than 934 yards of piping. The great question before the Water Committee at the present time was as to whether they should or should not accept an offer of reservoirs already made at Todmorden. A deputation was then in London to seek counsel and advice of Mr. Mansergh in reference to the desirability of effecting the suggested purchase. They wanted to know whether their present reservoirs were capable of being made higher, so that they would impound more water, and also whether there were other sources of water supply in Rochdale that the Corporation could purchase, and as to how long the present water supply would last. Further, Mr. Mansergh was to be asked to put his value upon the water-works at Todmorden. The Council were allowed until the 19th of October to say whether they would or would not purchase these works. Mr. Tomlinson, the Manager of the Rochdale Water-Works, told them that Mr. Hawksley, who had to do with the reservoirs at Cowm and Spring Mill, in calculating as to how long the water supply would last the town, estimated for a consumption of 20 gallons of water per day per head of the population. He (Mr. Sharp), however, did not think that every individual in Rochdale used 20 gallons of water per day; and this matter wanted careful consideration. The Council would also have to consider the needs of the present population, and also the probable needs of future generations, and would have to say whether the water-works at Todmorden would be a bargain to the town. He hoped they would not do as was done many years ago in regard to the Piethorn supply—allow the offer to pass by, and when they found that they wanted the works, discover that they could not get them.

At the same meeting, Mr. Councillor Howarth observed that he did not think the borough water supply was exhausted; and he should not go in for spending more money and increasing the rates till he was satisfied that the town had exhausted the present means of supply. He did not know why they should call in people from London to report upon the needs of Rochdale. A man from London did not know what was required in Rochdale so well as the Water Committee of the Corporation.

This reported action of the Rochdale Corporation in purchasing the works of the Todmorden Water Company is causing much stir in the locality; and it is said that the price agreed upon for the sale is £130,000. A correspondent of one of the local papers says: "For some time the Todmorden Corporation have been negotiating with the Company with a view to supplying Todmorden with water; and if Rochdale has secured the works, it cannot be looked upon in any other light than a calamity to Todmorden, where the private springs are now quite inadequate to serve the district. The works have always been looked upon as belonging to Todmorden, though the owners have, of course, a perfect right to sell the concern to the best advantage. There is no proper supply of water to Todmorden; but many have put in the Company's water owing to the inadequate supply to their property, and in this way it has always been considered as part and parcel of the borough." Another correspondent states: "The inhabitants of Todmorden have reason to feel chagrined and humiliated. For two years back the Corporation have been carefully negotiating for the purchase of the Todmorden Water-Works Company's extensive works, which supply a great part of their district. Unknown to the Corporation, however, the neighbouring Corporation of Rochdale have positively entered into an arrangement with the Water Company for the purchase of the works. The price agreed upon is £130,000; and it is anticipated the bargain will be ratified in a month."

THE VALUE OF WATER-METERS IN RESTRICTING WASTE.

Experience in Detroit (Mich.).

A short time ago, a Bill was before the Senate of the State of Michigan, having for its object the abolition of water-rents, and charging upon the general rates the expenditure incurred in furnishing a free supply of water. The Bill was referred to a Committee before whom appeared Mr. L. N. Case, the Superintendent of the Detroit Water-Works, who opposed the measure. Mr. Case is an advocate of the meter system, which has been for several years in successful use in Detroit; and he gave the Committee his views thereon and the results achieved thereby. These have been published in American contemporaries; and they may not be without interest for many of our readers. Mr. Case said:

Under the present laws, the expenditures for the construction and operation of the Water Department of the city of Detroit, with the exception of $75,000 annually received from the tax levy, are assessed upon the properties in the city on the basis of the consumption of water. Under this Bill, the expenditures are to be assessed upon the properties upon the basis of their valuations. I desire to make two statements which I hope to prove to your satisfaction: First, under the proposed law, doing away, as it does, with all personal responsibility, and necessarily also with the means to prevent excessive use and waste, the expenditures of the Water Department will in a little while be doubled, soon after trebled, and ever thereafter continue to increase faster than the population or the valuation of properties. Secondly, inasmuch as the expenditures of water-works depend almost entirely upon the volume of water, it will be manifestly unjust to assess the cost thereof upon the property; because, under this Bill, a person may use from double to 500 times as much water as another, and pay the same, or less.

I wish to emphatically refute the idea prevailing among many that because we have an inexhaustible supply, and because we have engines and pipes, the only difference in our expenses for supplying larger quantities is the extra coal required under our boilers. There is as fixed a limit to our capacity as though we were supplying the city by means of teams and barrels; and in this connection I will ask you to suppose that we are doing so. If one team can distribute on the average 40 barrels of water a day, then every additional 40 barrels requires the purchase of an additional team. If A. uses 40 barrels each day, he requires the expense of purchasing and running one team. If B. uses 4000 barrels each day, he requires the purchasing and running of 100 teams. Under these conditions, who is there so unjust and unreasonable as to advocate the idea of requiring A. and B. to pay the same should they happen to occupy properties of equal valuations?

Now, in regard to our present conditions. We have four engines at our pumping-station, the capacity of each being 24 million gallons a day.

One of these must remain idle as a reserve in case of accident or necessity for repairs in the other three; therefore, our maximum pumping capacity is 72 millions. We have three force-mains coming down from the pumping-station to the eastern part of the city. The capacity of each of these mains is 24 million gallons. For every additional 24 millions, or fraction thereof, we must purchase another engine and lay another force-main, which cost, at our last enlargement, $350,000. The water is then carried into our distribution system, which is as limited in its capacity as that of the engines or the force-mains. To illustrate this, I submit the following tables as showing our condition three years ago:—

Head pumped against at station	108 feet.
Average elevation to overcome	43 ,,
Frictional loss	26 ,,
Average head in the city	39 ,,

This head was not satisfactory to the people, and it became necessary to increase it. The question from the Board was: "What is the 26 feet frictional loss?" The answer was: "Trying to force more water through pipes than is their capacity." Then came the question of how this could be reduced; and the answer was: "By reinforcing the distribution system." To this end several large mains were laid in different portions of the city, with the following results:—

Head pumped against at station	108 feet.
Average elevation to overcome	43 ,,
Frictional loss	14 ,,
Average head in the city	51 ,,

This result was accomplished by an expenditure on our pipe system of $538,000. If our present supply is increased to any great extent, we shall return to our former conditions. Frictional loss increases proportionately as the square of the velocity. Increased quantities sent through the same pipes means increased velocities and a rapid decrease in the head supplied.

From these facts you will see that to keep down the expenses of a water-works, both for construction and operation, it is necessary to keep down the quantity of water pumped. The question, therefore, of preventing excessive use and waste becomes a most important one, and is a question that is agitating the minds of water-works superintendents, engineers, and other officials and citizens, all over the world.

The first fact to determine is: How much will be a liberal supply for a municipality? Three years ago, London was arranging to go to Wales for its water supply. It became necessary to ascertain how much water would be required in order to know the size and number of conduits necessary. A Water Commission was appointed; and the result of their study and investigation was that 42 gallons daily per head was decided to be a generous allowance. Paris last year pumped 36 gallons per head; Liverpool, in 1881, only pumped 27½ gallons, though, as their Engineer has put it, "there is probably no modern city in which the legitimate demands for water and the facilities for using it are greater than in Liverpool." Providence, in our own States, with about 85 per cent. of its services metered, pumped last year only 59 gallons. Considering these facts, I am justified in saying that 50 gallons per head per day is a reasonable quantity for the supply of a city. If, therefore, we are told that a community is consuming 200 gallons per day, what does it mean? It means four engines instead of one, four force-mains instead of one, four tons of coal instead of one, and four engineers instead of one, at an expense to the people of hundreds of thousands of dollars annually, without accomplishing any good whatever. Knowing this, does it not seem impossible that there can be found one man who will not favour restrictions to stop this squandering of the people's money.

There has been found but one really efficient restriction to waste, and that is the meter, though assessing upon the basis of consumption as estimated is a partial restriction. The latter prevents the introduction of uses which the consumer is unwilling to pay for. I will illustrate this point. There are in the city of Detroit about 500 stationary engines, all of which should have a condenser attached, did not the cost of the water exceed the saving to be effected. It takes 30 gallons of water to condense 1 gallon from steam. Should an assessment on an engine amount to $25 per annum, it would cost $750 for condensation. If this Bill is passed, in one week every one of these engines will have a condenser; and, besides, innumerable mechanical contrivances, elevators, &c., will be run by water-motors.

For some years, and up to 1889, Detroit, Buffalo, and Philadelphia operated upon the assessment plan entirely. Detroit pumped a daily supply of 204 gallons per head. Our capacity was more than exhausted, and complaints of short supplies were bitter and unceasing. On March 6, 1889, I demonstrated to the Board that meters must be used to stop this enormous waste, or an enlargement of the works undertaken immediately at an estimated expense of $600,000. The introduction of meters was decided upon. The following conditions of these three cities in 1887 and 1896 will show the results of this step in Detroit and of the continuance of the old method in Buffalo and Philadelphia:—

	Quantity Pumped Daily, in Million Gallons. Year 1887.	Year 1896.	Increase of Population. Per Cent.
Buffalo	38	101	34
Philadelphia	88	239	46
Detroit	36	36	56

Detroit, at the same rate of increase as Buffalo and Philadelphia, which corresponded exactly with her increase previous to using meters, would have pumped 101 million gallons daily. This would have required an expenditure of upwards of $200,000 for engines and pipes more than was expended, and an extra outlay for pumping water of $94,900 for last year, with a proportionate increase for the intervening years.

What has this done for the people? If they have not benefited by this saving of water in reduced rates then all this talk about economy is nothing but "rot." Meters were introduced in 1889, and so beneficial were the immediate effects, that the Board of Water Commissioners began the reduction of their rates in 1890; and they have continued from time to time in subsequent years to make other reductions. The following figures show the effect on the income of the Board by these reductions: 1891, $22,133; 1892, $31,770; 1893, $45,797; 1894, $48,448; 1895, $52,575; 1896, $98,740; 1897, $142,000—total, $441,463. So that in seven years the Board have paid back to the people, as a result of this restriction of waste, $441,000, in round numbers. In addition, they have expended $538,000 in such enlargement of the works as would increase the quantity supplied per head 33⅓ per cent.; and they have reduced their bond indebtedness $400,000. This is the result of what has been called "squandering" $151,000 for the purchase, placing, and caring for about 5000 meters. One more display, and I have finished. The water-rates collected in 1890 amounted to $387,000; in 1897, to $386,000, with 75,000 more people.

I will only say, in conclusion, that this spectacle is presented to you for consideration: Greater New York, Cincinnati, Buffalo, Philadelphia, Boston, and other cities all over the States, are urging, in various ways, the adoption of the methods pursued in Detroit, pointing to this city as an example worthy of emulation; and you are asked to favour a Bill that will force the abandonment of these very methods, and place the city in a far worse condition than any other in the world.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

To all who are interested in the construction of gas-works, this week brings the welcome information that it is in contemplation to erect entirely new works in both Glasgow and Edinburgh.

In Glasgow, there are already works at Dawsholm for the west and north of the city, at Tradeston for the south, and at Dalmarnock for the east. They are found to be, notwithstanding huge extensions in the recent past, rapidly becoming almost unequal to the demand which is made upon them. To further extend existing works would, I presume, be a costly proceeding, because of the fact that buildings would have to be acquired as well as land—both at high prices. At least, this would be so at Tradeston and Dalmarnock, where the pressure is most felt; and so it has been resolved to erect entirely new works. I understand that several sites have been inspected; but I cannot yet say that one has been selected. It is announced, however, that boring is being proceeded with on Hamilton Farm, to the east of Rutherglen. The site is on the banks of the River Clyde, on a low level, and iswell served by railway from the coalfields, which are only a mile or two off. Indeed, if it should be selected, it would almost fulfil the often-expressed desideratum of having the gas-works at the coal pit, and sending the gas, however far, into the town, rather than carrying the coal to the town and then converting it into gas. There is little doubt that Hamilton Farm will in a few years be surrounded by a dense population, for whom a gas supply will be necessary. But even if it were not, it is sufficiently near the eastern and southern parts of the city to be available for their supply; being only about three miles from Glasgow Bridge, as the crow flies. The site extends to about 50 acres. At present, the ground is being searched to ascertain if there are any underground coal workings, which are undesirable to have below any works, as they might lead to disaster.

As to Edinburgh, there is likely to be a good deal of difficulty; but it is felt that the erection of new works must before long be faced. I may say that Mr. Herring, the Engineer, makes no secret of his belief that new works are a necessity. I had it from his own lips within a few weeks of his arrival in Edinburgh. The subject has, however, been brought before the public in a peculiar way. On Wednesday, there was a ceremony in the city in connection with the formal "opening" of the new North Bridge for traffic—which, by the way, had never been closed except for an hour before the ceremony. Afterwards a luncheon was served to a large party in the Royal Hotel, at which Sir William Arrol, whose firm supplied the steel-work for the bridge, was present. Lord Rosebery was also one of the company; and in proposing the toast of the "City of Edinburgh," he waxed eloquent upon the beauties of the place. His Lordship is very fond of Edinburgh, and is never tired of extolling its attractions. On this occasion, he described it as "the joy of the whole earth," and so on, and went on to say that the continuance of its splendour depended, in the main, upon its government. This keynote having been struck, when it fell to Sir William Arrol to respond for the toast of "The Contractors," he too fell to belauding the city for its beauty. According to him, the valley which is spanned by the North Bridge is "one of the most picturesque valleys to be seen in the whole world." "Every native of Scotland," he said, "was interested in the prosperity and the amenity of the city of Edinburgh;" and he thought the Corporation should not forget that in the middle of the valley of the North Bridge there is the gas-works, which they ought to remove as quickly as possible. He was sure it would pay the Corporation of Edinburgh to remove the gas-works, because, with the smoke and dirt about them, they cost the city more than was generally believed. He would advise that the site should not be given up for railway purposes, but be kept in the hands of the Corporation; and perhaps some generous citizen might erect a stately building upon it. It is refreshing to have Sir William Arrol, the hard-headed erstwhile son of toil, talking æstheticism. But gas managers had practical proof, in their visit to his charming residence in Ayr, last July, that he is a gentleman who is very deeply devoted to the cultivation of art, and strives to surround himself with all that is beautiful. His advice is therefore doubly valuable. He speaks of the love of the picturesque, and also one who is accustomed to count the cost before he takes up a tale. I do not know whether Sir William had received any hint of what was taking place, or had been inspired in any way; I rather think not. It turns out, however, that Mr. Herring has prepared a report upon the very subject of the erection of new gas-works. This report is given elsewhere in the "JOURNAL" to-day (see p. 638). It was published in the "Scotsman" of Friday. Its appearance has already been made matter of indignant protest by Mr. Waterston, one of the Gas Commissioners; and I should not be surprised if Mr. Herring also protested. According to Mr. Waterston, the report was read over hurriedly to a Committee of four, none of whom got a copy of it. It had not been considered in any way, and its publication was a direct breach of confidence. "He objected to an official taking a document which had not passed through the hands of his superiors, and handing it to any newspaper." Mr. Waterston's bark is worse than his bite. His fulminations are always very frothy; but when read between the lines, they generally have a meaning. Although he singled out "an official" as the betrayer of this great secret, I would not be surprised to learn that he had no information which led him to believe that it was an official. I myself, speaking from experience, have no hesitation in saying that it is not from officials that newspaper representatives receive

such documents; it is from the public representatives themselves. I think Mr. Waterston is aware of this fact; if he is not, he may take my word for it. I have no concern with how the document was divulged; but I do not like to have officials blamed for what, I am convinced, none of them did. The report is now, however, public, and cannot be recalled. It speaks for itself. Mr. Herring has taken up a position from which he cannot be dislodged; and the Commissioners must face the question of the removal of the Edinburgh Gas-Works, and it may be, of the Leith also, no matter what is the cost. They had settled themselves down, after the erection of the new chimney, the carburetted water-gas plant, and other alterations, to a lengthened residence where they are; but the circumstances are such that they must leave. The Edinburgh works cannot be extended. There is the rocky Calton Hill on one side, a churchyard on another, a railway yard on a third, and the fourth is virtually the thoroughfare of the Canongate. The Leith works, or, to be particular, the ground adjoining them, which the Gas Commissioners own, it now transpires is not suitable for the construction of underground plant. A new site must therefore be obtained. Mr. Herring advises that one site should be procured, and that a central works should be erected upon it. This would certainly be the most economical method of solving the difficulties connected with the gas supply; but I rather incline to the notion, for more reasons than one, that two works should be looked forward to. The Commissioners, I know, have been looking out for a site for some time; having all along had in view the fact that they would require to remove some day. The selection of a site in Edinburgh, where amenity is so prime a consideration, is no easy matter—not simply for a gas-works, but for other and altogether inoffensive buildings. For example, a year ago a citizen gave the Town Council £100,000 towards the erection of a Town Hall; and to this day it has not been agreed where to place the building. The proposal to erect a gas-works in any neighbourhood, would raise the whole of the residents in the district in arms. The old Edinburgh Gas Company, eleven years ago, proposed to erect new works at Niddrie, on a site which would have been very suitable in every way, except that it would have been served by only one railway. I am afraid, however, that this site is not now available. Edinburgh having taken over Portobello as a seaside resort, could not afford to destroy it by the erection of a gas-works in its vicinity. The question of site will doubtless be a long and a bitter fight; and therefore the sooner the Commissioners set themselves to the consideration of Mr. Herring's report the better.

Before leaving the subject of the Edinburgh works, I must say it is very disappointing that the new chimney has turned out to be such a failure. At the present moment, men are working upon it. The fire-brick lining differs from that of most chimneys, in that it is carried to nearly the top; and the space between it and the outer shell of the chimney, at the top communicates with the open air. There is some alteration going on there. It is also given out that the chimney—which I take to be the lining—is to be banded in more than one place. Mr. Waterston is again useful to me. Speaking to his Committee last night he said: "Half the heat has not been introduced into the new chimney yet; but it is of no value to us at this moment. A steeple-jack has reported to us that we shall have to spend about £200 in rectifying the chimney. A magistrate of Leith put the question as to what had been the behaviour of other chimneys built on the same lines; and the answer was that everyone of them had given way." This is as unpleasant to write as I have no doubt it will be to read. But the steps in the advance of knowledge are successive failures; and it is better that the failure of this chimney in Edinburgh should be known, than that it should be concealed and that other bodies should fall into the same mistake when they have to undertake similar work.

At a meeting of the Glasgow Town Council last week, Bailie Dick asked the Convener of the Watching and Lighting Committee if any steps were being taken to look into the matter of the use of incandescent gas lights in the streets of the city. They made an experiment with the light some time ago, which he considered successful. He wished to ask if they proposed to do anything further in the matter. Mr. Primrose replied that the experiments they had made had been successful; but that, in view of the probability of their lighting a great many of their leading thoroughfares with electricity, they had deemed it prudent not to incur any expense till they saw the extent to which the light was to be adopted for public purposes. When this matter was settled, they would probably extend incandescent gas lighting to other districts. On Thursday there was another meeting of the Council, at which Mr. P. G. Stewart called attention to the report of the Gas Committee on the hire of gas-stoves, which stated that at the present time 12,931 stoves were in use. The report, he said, was unsatisfactory. In London and other English cities, where stoves were hired at much lower rates than in Glasgow, the proportion in use was much larger. He thought that a central showroom should be obtained for displaying the stoves. Mr. R. M. Mitchell asked Mr. Stewart to bring the matter up at the Committee meeting.

The Police Commissioners of Troon are complaining that the price of gas in the burgh is too high; and on Monday night of this week, they resolved to proceed with the adoption of the Burghs Gas Supply Act, with a view to acquiring, at an early date, the undertaking of the Troon Gas Company.

Some discussion took place at the Valuation Appeal Court in Stirling this week, on the fact that the Assessor had raised the valuation of the Stirling Gas Company's works only from £1600 to £1700. A member cast up that Mr. Hepworth, of Edinburgh, in the reference before Sheriff Lees, stated the maintainable annual profit of the undertaking to be £2869. The Assessor explained that he wanted to raise the valuation to £2000, but sufficient notice had not been given. There is a disposition to badger the Company on the part of those who were opposed to the proposed transfer. It may be taken for granted that they will not lose sight of this opportunity of be-littling the undertaking, and showing how right they were. The Gas Company can afford to let them have this cheap notoriety. It is all the satisfaction they will get out of their foolish policy, which lost the Company's undertaking to the town. The promoters of the transfer are very quiet. I expected they would have endeavoured to go on with the movement; but they have apparently accepted defeat, and are resolved not to proceed further.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 628).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	9 Apl.	10½	Alliance & Dublin 10 p. c.	24—25	..	4 4 0
100,000	10	,,	7½	Do. 7 p. c.	17—18	..	4 3 4
300,000	100	1 July	5	Australian (Sydney) 5% Deb.	106—108	..	4 12 8
200,000	10	27 May	7	Belgrano (B. Ayres), Limited	9½—10	..	7 0 0
100,000	Stck.	29 June	5	Do. 5 p. c. Deb. Stk	103—106	..	4 14 4
200,000	5	27 May	6½	Bombay, Limited	6¾—7¼	..	4 9 7
40,000	5	,,	6½	Do. New, £4 paid	5¼—5¾	..	4 10 7
330,000	Stck.	27 Aug.	12	Brentford Consolidated	297—302	..	3 19 5
240,000	,,	,,	9	Do. New	220—225	..	4 0 0
50,000	,,	,,	5	Do. 5 p. c. Pref.	145—150	..	3 6 8
159,375	,,	11 June	4	Do. 4 p. c. Deb. Stock.	135—139	..	2 17 6
220,000	Stck.	15 Sep.	11½	Brighton & Hove Original	270—275*	+2¾	4 3 7
208,820	,,	,,	8½	Do. A Ord. Stk.	200—205*	+3¼	4 2 11
933,500	Stck.	27 Aug.	5	Bristol, 5 p.c. max.	130—135	..	3 14 1
420,000	20	26 Mar.	11¼	British	56—57	..	3 18 11
50,000	10	27 Aug.	11¼	Bromley, Ordinary 10 p. c.	23—25	..	4 12 0
71,000	10	,,	8½	Do. 7 p. c.	18—20	..	4 5 0
500,000	10	28 Apl.	6	Buenos Ayres (New) Limited	10½—11½	..	5 4 4
98,122	Stck.	—	4	Do. 4 p. c. Deb. Stk.	98—100	..	4 0 0
150,000	20	15 July	8½	Cagliari, Limited	30—32	..	5 3 1
100,000	10	11 June	8	Cape Town & District, Ltd	16¾—17¼	..	4 11 8
50,000	50	3 May	6	Do. 6 p. c. 1st Mort.	59—60	..	5 0 0
550,000	Stck.	9 Apl.	13½	Commercial Old Stock	343—348	..	3 17 6
165,000	,,	,,	10½	Do. New do.	257—262	..	4 0 1
165,000	,,	11 June	4½	Do. 4½ p. c. Deb. do.	155—158	..	2 16 11
800,000	Stck.	11 June	13	Continental Union, Limited.	255—260	..	5 0 0
200,000	,,	,,	10	Do. 7 p. c. Pref.	215—220	..	4 10 11
51,600	Stck.	27 Aug.	14	Croydon Com'cial A 10 p. c.,	315—320	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	252—257	..	4 5 7
335,000	Stck.	12 Aug.	5¼	Crystal Palace Ord. 5 p.c. Stk	137—140	..	3 15 0
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—143	..	3 9 11
486,090	10	29 July	11	European, Limited	25—26	..	4 4 7
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 11
5,896,590	Stck.	12 Aug.	12½	Gaslight & Coke, A, Ordinary	317—320	..	3 19 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	113—118	..	3 7 10
665,000	,,	,,	10	Do. C, D, & E, 10 p. c. Pf.	315—320	..	3 2 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	150—155	..	3 4 6
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	220—225	..	3 6 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	203—208	..	3 7 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	315—320	..	3 2 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	180—185	..	3 4 10
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.,	138—141	..	2 16 9
394,850	,,	,,	4½	Do. 4½ p. c. do.	155—158	..	2 16 11
938,000	,,	,,	6	Do. 6 p. c. do.	207—212	..	2 16 7
70,000	10	13 May	6	Hongkong & China, Limited	14—15	+½	4 0 0
3,800,000	Stck.	13 May	10	Imperial Continental	217—222	..	4 10 2
376,400	100	3 Aug.	4	Do. 4 p. c. Debs. Red.	99—102	..	3 18 5
473,600	Stck.	12 Aug.	3½	Do. 3½ p. c. Deb. Stk ,,	104—107	..	3 5 5
75,000	5	29 June	6	Malta & Mediterranean, Ltd.	5½—6	..	5 0 0
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	112—114	..	4 7 8
250,000	100	,,	4½	Do. 4½ p. c. Debs.	108—110	..	4 1 10
541,920	20	11 June	5	Monte Video, Limited	15—16	..	6 5 0
150,000	5	27 May	8	Oriental, Limited	8—8½	..	4 14 1
135,000	5	,,	8	Do. New, £4 10s. paid	7½—7¾	..	4 12 10
15,000	5	,,	8	Do. do. 1879, £1 paid	1½—2	..	4 0 0
60,000	5	26 Mar.	7	Ottoman, Limited	4¾—5¼	..	6 13 4
420,000	100	3 May	6	People's Gas } 1st Mtg. Bds.	104—109	..	5 10 1
500,000	100	1 June	6	of Chicago } 2nd Do.	105—110	..	5 9 1
250,000	10	27 May	10	San Paulo, Limited	14½—15½	..	6 9 0
5,475,000	Stck.	12 Aug.	5½	South Metrop., 4 p.c. Ord.	145—148	..	3 10 11
1,416,667	,,	15 July	3	Do. 3 p.c. Deb. Stk.	105—109	..	2 15 0
60,000	Stck.	15 Sep.	12	Tottenham & Edmonton, A	275—285*	+6	4 4 2
60,000	,,	,,	9	Do. B	190—200*	+4½	4 5 0
182,380	10	27 May	10	Tuscan, Limited.	13¾—14¼	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	100—103	..	4 17 1
				WATER COMPANIES.			
746,159	Stck.	29 June	10½	Chelsea, Ordinary	335—340	..	3 1 9
150,000	,,	,,	5	Do. 5 p. c. Pref.	177—180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	157—160	..	2 16 3
175,785	,,	26 Mar.	4½	Do. 4½ p. c. Deb. Stock	160—165	..	2 14 6
1,720,560	Stck.	9 Apl.	7½†	East London, Ordinary	225—230	..	3 5 2
654,740	,,	29 June	4½	Do. 4½ p. c. Deb. Stk.	163—166	..	2 14 3
390,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	106½—107½	..	2 15 10
700,000	50	11 June	7½	Grand Junction, 10 p.c. max.	120—125	..	3 0 0
295,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	148—153	..	2 12 4
708,000	Stck.	12 Aug.	13	Kent	351—356	+1	3 13 1
160,000	,,	,,	7	Do. New, 7 p. c. max.	215—220	..	3 3 7
1,043,800	100	29 June	9¾	Lambeth, 10 p. c. max.	288—293	..	3 6 6
406,200	100	,,	7½	Do. 7½ p. c. max.	223—228	..	3 5 9
350,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	147—150	..	2 13 4
500,000	100	12 Aug.	13	New River, New Shares.	444—449	+2	2 17 11
1,000,000	Stck.	29 July	4	Do. 4 p. c. Deb. Stk.	151—154	..	2 11 11
902,300	Stck.	29 June	5	S'thwk & V'xhall, Ordinary	160—163	..	3 1 3
126,500	100	,,	5	Do. Do. 7½ p. c. Max.	151—154	..	3 4 11
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	173—178	..	2 16 2
1,019,585	,,	9 Apl.	4	Do. 4 p. c. A Deb. Stk.	145—148	..	2 14 2
1,155,066	Stck.	11 June	10	West Middlesex	313—318	..	3 2 10
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163—166	..	2 14 3

† Next dividend will be at this rate. *Ex div.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 18.

Sulphate of Ammonia.—The greater activity in the market which commenced about the middle of August, has continued throughout the past week; and a further improvement in values has to be recorded—the closing quotations being £8 1s. 3d. to £8 3s. 9d. per ton, delivered free on board at the ports. Spot stuff has been scarce, and has readily been disposed of; and a good business has been done for September and October delivery at full values. In the forward position, transactions are reported at £8 2s. 6d. per ton October-March delivery; and there are further buyers at the price. But the advance now required by makers is checking additional business. London has been sold at £7 17s. 6d. per ton, October-December, Beckton terms; and £8 per ton is now asked.

Nitrate of Soda is steady on spot at 7s. 6d. per cwt. for good, up to 7s. 7½d. per cwt. for fine quality. In the forward position, the market is rather firmer; but without much actual change in values.

LONDON, *Sept.* 18.

Tar Products.—There is no change of any importance in the value of products during the week. Benzols are a little more inquired for; but buyers will not pay the somewhat higher quotations asked by makers. The expectations of a better price for pitch, with the advent of the shipping season, have not so far been realized. The tone, however, is, if anything, firmer. Large shipments are now taking place; and it is thought that the present low prices will enlarge the consumption materially, especially as fuel is advancing in price. Tar oils are weak; but the consumption is undoubtedly large. There is no change for the better in anthracene; but the market is firmly held by the Committee. Carbolic acid continues to droop; but prices quoted are nominal, as little or no business is done in the article. Naphthalene is in better request; but prices offered form no inducement to separate it from oils.

To-day's values may be taken as: Tar, 16s. 6d. to 20s. Pitch, 17s. to 20s. Benzol, 90's, 1s. 9d.; 50's, 1s. 11d. Toluol, 2s. 2½d. Solvent naphtha, 1s. 6½d. Crude, 30 per cent., naphtha, 10½d. Creosote, 1½d.; liquid, 2d. Heavy oils, 40s. Carbolic acid, 60's, 1s. 9½d. Naphthalene, nominal, 40s. Salts, 20s. Anthracene, "A quality," 5d. to 6d.; "B," 4d. to 5d.

Sulphate of Ammonia.—This market is firm in all positions. There is an excellent business being done; and inquiries are good from all quarters. To-day's price is £8 2s. 6d., less 3½ per cent. at all ports; but there is a short supply; and buyers are a little urgent. It is possible the next few days may witness a further advance in this much-neglected, but useful, nitrogenous manure.

Rugby Water Supply.—The Rugby District Council are proposing to spend £2700 in improving their water-works. Of this sum, £1200 is required for a pumping-engine; £600, for an engine-house; and £900, for new mains. An inquiry into this and other matters has been held by Lieut.-Col. Smith, one of the Inspectors of the Local Government Board. There was no opposition.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—During the past week the better qualities of round coal have not been moving off quite so actively. Very few pits are working more than four to four and a half days per week; while those that are on full time are putting into stock. Prices, however, are steady; but there is no actual advance upon current rates. Steam and forge coals are moving off only slowly; and supplies are ample, with prices in some cases difficult to maintain. Engine fuel is also more plentiful. Prices are showing less firmness than of late; but generally quotations are unchanged. At the pit mouth, best Wigan Arley averages about 10s. per ton; Pemberton four-feet and seconds Arley, 8s. 6d.; common house coal, 7s.; steam and forge coal, 6s. to 6s. 3d.; and engine fuel, 3s. to 3s. 6d. for common sorts, 3s. 9d. to 4s. 3d. for medium, and 4s. 6d. to 4s. 9d. for best qualities. For shipment, there is a fair amount of business doing; and good ordinary steam coals are fetching 7s. 6d. to 8s. per ton delivered at the Mersey ports or the Partington tips of the Manchester Ship Canal, and about 8s. to 8s. 3d. per ton delivered at the Manchester Docks.

Northern Coal Trade.—There has been an improvement in the gas coal trade of this district; but the demand for steam coals seems to have fallen off slightly, though there are still some weeks of heavy shipment before the close of the Baltic season. Best Northumbrian steam coals are 8s. 6d. per ton f.o.b.; second qualities, 8s. Manufacturing coals are quieter, through the effects of the strike. Gas coals are in heavier demand, both for export and for local use; and it is probable that the shipments to some of the great gas companies are heavier now than they have previously been at a similar season. Much of the output of gas coals is being taken up on old contracts at low prices; and for the remnant of the production that is left, comparatively high rates are asked for best Durham qualities. One producer quotes 8s. 6d. per ton f.o.b.; but the general rate for occasional cargoes is 7s. 9d. to 8s. The increase in the demand for gas coals, and the fact that one or two of the collieries that produce this class are idle, makes it probable that the demand will be barely met in the latter part of the year, though at the present time the production is very full. The demand for gas coke, at the present time, is up to the output; and stocks are limited even at some of the inland gas-works.

Scotch Coal Trade.—There is a good demand all round for coal; supplies being short owing to the miners having begun to restrict their working days to five, and in some instances to four, per week. This step is taken in support of a demand for an advance of wages, which is likely to be resisted by the masters. The shipping trade is very active. The quotations are: Main, 7s. per ton f.o.b. Glasgow; ell, 7s. 6d.; and splint, 7s. 6d. The shipments for the week amounted to 186,265 tons—an increase of 14,816 tons over the previous week, and of 29,188 tons over the corresponding week of last year. For the year to date, the total shipments have been 5,566,829 tons—an increase upon the same period of last year of 237,498 tons.

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An Illustrated Advertisement of the Plant will appear next week.

Proposal to Purchase the Bognor Water-Works.—The Bognor Urban District Council have appointed a Committee to confer with the Bognor Water Company with a view to purchase their undertaking.

The Proposal to Purchase the Yeovil Gas Undertaking.—The Directors of the Yeovil Gas Company have refused the offer of the Yeovil Town Council to purchase the gas undertaking for £48,000. This figure would work out at the rate of £24 per share, originally issued at £10.

A Water Famine at Southampton has been experienced since last Friday night (although there is an abundant supply at the water-works at Otterbourne), owing to some serious defect in the mains. On Saturday the Mayor caused water-carts to be sent round to the inhabitants generally. It was found that the electric light works had no water; and the firemen with their engines pumped the adjoining wells, so that the streets of the town depending on the light should not be in darkness. Workmen are busy repairing the defective mains.

Popularity of Prepayment-Meters in the Burnley District.—Penny-in-the-slot gas-meters appear to be very popular in the Burnley district; and the Corporation have decided to apply to the Local Government Board for sanction to borrow an additional £10,000 to cope with the demand in this department. In September, 1896, sanction was secured to the borrowing of £5000 for the purchase of meters; but this amount has all been expended, and £213 besides—almost entirely due to the number of prepayment meters put in. Prior to 1896, when penny-in-the-slot meters were first adopted—the Corporation averaged an expenditure on ordinary gas-meters of about £1200 or £1300 per annum. For the last two years, however, the average has been £3550 under this head; and the Corporation therefore feel justified in asking for £10,000, which it is estimated will last only about three years. The District Council for the adjoining township of Padiham have decided to borrow £200 for the purchase of prepayment meters.

Sales of Shares.—The Malton Gas Company's shares are evidently held in high esteem in the town. Last Tuesday, 63 £10 shares (on which only £8 had been paid) were offered for sale by auction; and the purchasers, through the keen competition, had to pay high figures for them. The top price was £23 5s. per share; and the bottom, £23. The last dividend was at the rate of 11 per cent. per annum. Ten £10 "A" shares in the Deal and Walmer Gas Company (bearing a dividend of 10 per cent.) have lately realized £23 2s. 6d. each; while five £10 "C" shares, with £7 10s. paid, bearing a dividend of 7 per cent., have been sold for £15 2s. 6d. apiece. A few £10 old shares in the Boston (Lincs.) Gas Company, paying a dividend of 8½ per cent., were sold last week at £18 12s. 6d. and £18 15s. each; and a number of new shares, paying 7 per cent., realized £15 and £15 15s. Some £25 shares in the Boston Water Company, on which the dividend is 9 per cent., yielded £55 and £55 5s. each. Thirty-four £20 shares in the Colchester Gas Company have changed hands at an average price of £35 5s. per share. At Preston last Thursday week, Messrs. Dewhurst and Son offered for sale a few lots of stock in the Preston Gas Company. £120 of "A" stock was disposed of at the rate of £225 per cent., and £555 "B" stock realized from £117 to £180 per cent.

The Manufacture of Water Gas at Stockport.—From the first, the Stockport Trades Council have been antagonistic to the manufacture of water gas by the Corporation; and they are now showing their solicitude for the safety of the men engaged in its production. At the meeting of the members last Tuesday, it was reported that an inquiry had been made of the Secretary of the Gas Workers' Union as to whether any special precautions were taken to protect the men; and he had replied that he was not aware of any. The Council decided to address the Corporation Gas Committee on the question.

The Glamorgan County Council and the Welsh Water Scheme for London.—The following notice of motion for the next meeting of the Glamorgan County Council has been given: "That it be referred to the Water Committee to consider, and report to the next meeting of the County Council, on the joint report of Sir Benjamin Baker and Mr. Deacon, which has been presented to the London County Council on the water supply of London, so far as that report deals with the advisability of obtaining such supply, to the extent of 400 millions of gallons per day, from the Usk and Llangorse and the Wye sources."

Northam Water Supply.—After discussing the question for many months, the Northam Rural District Council have (under a threat from the Local Government Board that they would be considered in default), decided upon a scheme of water supply for the parish. The matter came before the Council recently in a second report on the subject by Mr. Baldwin Latham. It is proposed to form a reservoir on Melbury Moor, which is in the watershed of the River Yeo. The gathering-ground was reported by Mr. Latham to be practically free from habitations, or danger of contamination; and Dr. Rouse, the Medical Officer for the district, confirmed the statement that the water is of very good quality. It will be a gravitation scheme; the cost being estimated at £24,000, as against £22,300 for what is known as the Abbotsham scheme, in which pumping would be necessary. Mr. Latham recommended the Council to obtain parliamentary powers, with the object of securing sixty years for the repayment of the loan. It was decided to take the necessary steps for an application to Parliament next session.

The Chichester Water-Works Transfer.—At a meeting of the Chichester Town Council on Thursday a communication was received from the Local Government Board with regard to the stock proposed to be issued for the purpose of the Chichester Corporation Water Act. It was pointed out that most of the sums in respect of which the Corporation had applied for the power to issue stock, are estimated amounts only; and also that the borrowing powers of the Corporation are limited to the precise sums properly payable for the purposes referred to in section 43 of the Act. There is no power to include in any consent order any larger amounts. A delay in the creation of the stock being recommended by the Finance Committee, Mr. Ballard reminded the Council that, unless the purchase money was paid over to the Water Company by the 29th inst., the Council would be liable to pay the Company 4 per cent. on the £46,000 to be divided among the shareholders; and the difference between the 3 and 4 per cent. would, in twelve months, reach a total of £460. It was resolved to consider the matter at a special meeting.

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Illustrated Price Lists on Application.

LONDON OFFICES: 46, QUEEN VICTORIA STREET, E.C.

Wolverhampton Corporation Water Supply.—The Wolverhampton Town Council, at their last regular monthly meeting, authorized the Water Committee to lay down new and improved plant at the Cosford pumping-station, at a cost of about £6000. It was stated that the charges for working would be reduced by about one-half; and that this saving would cover the proposed capital expenditure in a few years.

The New Water-Works at Frimley.—After the half-yearly meeting of the Frimley and Farnborough Water Company last Saturday week, the Directors and shareholders adjourned to Frimley Green, to take part in the ceremony of laying the foundation-stone of the engine-house of the new water-works which are being constructed for the Company. Mr. A. C. Pain, M.Inst.C.E., J.P., the Chairman of the Company, presided; and Mrs. Pain was presented with a handsome trowel in order to perform the ceremony of stone-laying, which she did amid great enthusiasm. The new filter bed has been constructed at the pumping-station, and 27 miles of new service mains have been put down, while another 9 miles of pipes will be necessary to complete the scheme.

Shrewsbury Corporation Water Scheme.—At Shrewsbury last Wednesday, a meeting of ratepayers was held to consider the scheme for a new water supply which is contemplated by the Corporation (see *ante*, p. 185). The principal speaker was Mr. Barker, one of the members of the Council. He stated that the scheme had been twice before the ratepayers and almost unanimously rejected. It proposed to take the water from the Severn at Shelton, pump it into filtering-tanks, then to Great Hanwood, with storage for a single day, and then bring it back to the town. The estimate for this was £48,000, which it had been stated could be spent practically without cost to the ratepayers. A penny in the pound brought in £480, and the borrowing of £48,000 meant a rate of 5d. It was impossible to believe they could expend this money without cost. In addition to the £48,000, there would be an expenditure of £880 a year for pumping, the expense of putting the old mains in order (£14,500), and the extra cost of the carriage of coal. As to the quality of the proposed supply, Mr. Barker said there were 70,000 people above Shrewsbury pouring their sewage into the river. Two other members of the Council opposed the scheme; and a resolution was passed emphatically disapproving of the action of the members of the Council who are endeavouring to "force it on the town against the wishes of the great majority of the ratepayers." A petition to the Local Government Board against the scheme was also adopted for signature.

Water Finances at Bolton.—Last week we gave some particulars as to the gas supply, from the Bolton Borough Treasurer's annual report. To-day some figures may be extracted from the report as to the Water Department of the Corporation. The revenue dealt with in last year's summary showed a small decrease compared with the previous twelve months—£53,196, as against £53,734. This year, however, the deficiency has all been recovered, and more; the rental now being £56,495. The trade supply has also gone up very considerably; and the domestic has advanced by from £300 to £500 per quarter. It is thus clear, says Mr. Swainson, that the Corporation can well afford to lose Leigh and Hindley, albeit the loss means £3000 a year. It is evident, also, that had not these townships gone to Liverpool for their supply Bolton would ere this have had to go afield for fresh sources; and even now the period is not far distant when this will have to be done. After setting apart the sum of £2500 for renewals of works, the Committee were enabled to transfer £11,573 in aid of the rates. The bulk of the £2500 the Committee have in hand, as they only spent £800 in renewals last year. During the twelve months the sum of £6944 was spent on new works—chiefly extensions of mains, and outlay on the new watershed bought in the previous year. There has been nothing spent this last year on land; but steps are being taken for other purchases. A table appended to the report is interesting, showing the amounts received for domestic and meter supplies during the past ten years. It shows that in 1888 the domestic and meter supplies realized (respectively) £28,986 and £18,016; while in 1897 the figures were £35,656 and £19,978.

The report of the Directors of D. Hulett and Co., Limited, for the year ended June 30, shows a balance to the credit of profit and loss of £3068. A dividend is recommended at the rate of 7½ per cent. per annum, leaving a balance to be carried forward of £1463. Last year the dividend was at the rate of 5 per cent., with £2082 carried forward.

The Secretary of State for Foreign Affairs has received a despatch from Her Majesty's Consul General at Christiania stating that tenders are invited by the Director of the Christiania Gas-Works for the delivery of 1000 tons of Arniston, Tyne Boghead, or cannel coal of similar quality, or for 500 tons of Australian Kerosine-Shale. Further particulars may be seen at the Commercial Department of the Foreign Office any day between the hours of eleven a.m. and six p.m.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095, Holborn.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS;

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

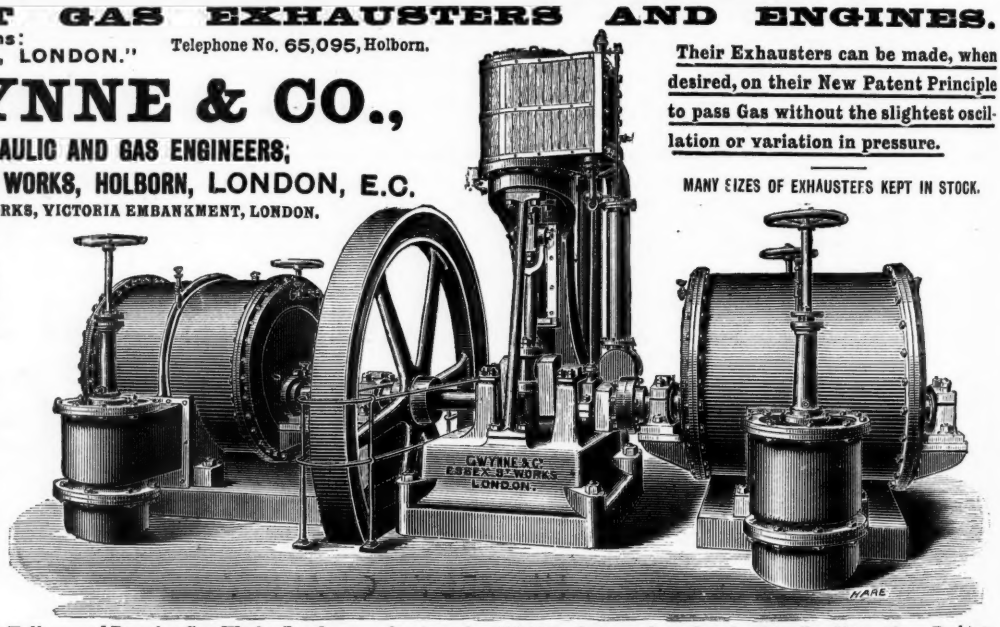
They have completed Exhausters to the extent of 35,000,000 cubic feet passed per hour which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.



Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

[For Illustrated Advertisement, see Sept. 7, p. 553.]

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs. Before placing Orders, please write for Estimate.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application. 70, CHANCERY LANE, LONDON, W.C.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

AMMONIACAL LIQUOR wanted.
Brotherton and Co., Ammonia Distillers.
Works: Birmingham, Leeds, and Wakefield.

GAS TAR wanted.
Brotherton and Co., Tar Distillers.
Works: Birmingham, Leeds, and Wakefield.

SPENT OXIDE wanted.
Brotherton and Co., Chemical Manufacturers.
Works: Birmingham, Leeds, and Wakefield.

SULPHURIC ACID for Sale.
Brotherton and Co., Chemical Manufacturers.
Works: Birmingham, Leeds, and Wakefield.

BROTHERTON & CO.
Offices: Commercial Buildings, Leeds.
Correspondence invited.

TUBES for Gas, Steam, and Water (all Sizes) Welded or Riveted. TANKS, HYDRAULIC MAINS, RETORT-LIDS, &c.
John Spencer, Globe Tube Works, Wednesbury and 14, Great St. Thomas Apostle, London.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 607, last week's issue.)
Telegrams: "Hutchinson Bros., Barnsley."

Price 2s., Post Free.

STEPHEN CARPENTER, on the Purification of Coal Gas by Lime, Oxide of Iron, and Atmospheric Air, and the Method of Working Purifiers so that the Lime may be used a second time, with a Description of Carpenter's short Method of Working off the Sulphur Test, and Table for Calculating Results.
S. Carpenter, Ryde House, 28, Woodhouse Grove, East Ham, Essex.

GAS Companies in Formation, District Councils, &c., desirous of Lighting their Districts, would do well to consult the Advertiser.
Address, in first instance, No. 2920, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

ADVERTISER (Age 31) requires Situation in a Gas Company. Good Accountant, quick and accurate at Figures, also knowledge of Shorthand. Accustomed to prepare Balance-Sheets.
Address No. 2918, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

ADVERTISER (age 24) desires a Situation as ASSISTANT MANAGER. Has been five Years a Pupil in Works making 400 Millions annually. Has a good knowledge of Gas Manufacture and Chemistry. Honours Certificate City and Guilds. Good Reference.
Address No. 2916, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Gas-Fitter, used to Iron and Lead work, Meter Fixing, &c.
Apply, in own Handwriting, stating Age and Wages required, with *copies* of Testimonials, to Mr. W. Murray, Manager, Gas-Works, Uttoxeter.

PUPIL WANTED.

A VACANCY will occur next Month for a PUPIL in the Office of a Gas Engineer in the Midland Counties. A large portion of the Premium will be returnable as Salary during the Three Years' Apprenticeship.
For full Particulars, apply, by letter, to No. 2901, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

LOUGHBOROUGH GAS COMPANY.

WANTED, a thorough practical Foreman. Must be a good Carbonizer, able to lay Mains and Services, and must understand the working of Exhausters, and all other apparatus on the Works.
State Age and Experience, and send one or two Testimonials.
Wages, 33s. per week, with good House, Coal, and Gas free.
Apply to
J. B. Ball,
Engineer and Manager.
Gas-Works, Loughborough.

GIBRALTAR GAS COMPANY.

WANTED, a Works Manager. Salary £200 Sterling per annum, with Residence, Fuel, and Light. Passage paid and Contract for Three Years. Make of Gas, 50 Million Cubic Feet.
Candidates must be thoroughly conversant with the details of a Gas-Works, and have a practical knowledge of the construction and working of Generator Furnaces.
Applications, stating Age, Qualifications, and previous Experience, and enclosing *copies* of three recent Testimonials, to be addressed to the undersigned, and posted not later than the 30th inst.
Benj. Carver, Jun.,
Chairman of the Board of Directors.
Gas Offices, Gibraltar,
Sept. 10, 1897.

SADLER & CO., Ld., Middlesbrough; Ulverston (Barrow); Portsmouth; Carlton (N.E.R.); and Stockton. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.
Correspondence invited.
Telegraphic Address: "Sadler, Middlesbrough."

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

ALEX. P. KER, C.E., Consulting Gas Engineer, Hunton Road, Gravelly Hill, Birmingham, 25 Years Assistant Engineer and Manager of Works to the Corporation of Birmingham and their predecessors, MAY BE CONSULTED on all matters connected with GAS ENGINEERING, including Valuations, Alterations, Additions and Extensions, &c. REPORTS upon EXISTING WORKS and IN PROGRESS. EXAMINATIONS OF GAS for ILLUMINATING POWER and IMPURITIES conducted. Plans, Specifications, and Estimates prepared.

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. Walker, Midland Iron-Works, Donnington, near Newport, Salop.
And J. Every & Son, Phœnix Iron-Works, Lewes.

WANTED, a good Main and Service Layer, to lay 700 yards of 6-inch and 4-inch Mains and connect-up Services.
Apply to S. G. Tulk, Gas-Works, Builth, Breconshire.

TO GAS STOKERS.

WANTED, a Stoker accustomed to Shovel and Scoop at a Works near London. Abstainer preferred.
Address No. 2921, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

CLEETHORPES GAS COMPANY.

WANTED, several Young Men for Winter Stoking. Good Wages and permanent employment to steady and capable Workmen.
E. J. Brockway,
Engineer and General Manager.

GAS-FITTER wanted at once to do Service Laying, Meter Fixing, Meter Inspecting, &c. Permanent job to a steady reliable Man.
State Age, whether Married or Single, and Wages required, and enclosing *copies only* of Testimonials, to
Thomas Layton,
Manager.
Gas-Works, Redditch.

WANTED, a good Draughtsman in a Gas Engineer's Office. Capable of getting out Working Drawings for all kinds of Gas-Works Buildings and Plant. Must have had good experience as a Draughtsman in the above class of work. First-class recent Testimonials absolutely necessary. State Wages required per week.
Apply to G. Winstanley, Gas-Works, Coventry.

FROME GAS COMPANY.

WANTED, immediately, a Collector, who has had experience in Accounts and taking Meters. Must be Married; and the Wife would have to attend to the Company's Show-room. Remuneration 35s. per week, with Residence.
Apply, by letter, on or before the 29th of September, to the Manager, Gas-Works, Frome.

GAS MANUFACTURE EXAMINATION.

GENTLEMEN engaged in the Industry wishing to be prepared for the City and Guilds Examination, can do so by a practical qualified Teacher. Successes last Season: Passed 100 per cent.; 48 per cent. First Class; one Medal.
Address No. 2922, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the Brimington Carbon Company, Sowerby Bridge, Yorks.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.**
J. F. Blakeley, Gas Engineer, Ravensthorpe, Yorks.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS,
Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, Weston Street, Bolton. Repairs of every description.
Please write for Estimate before ordering elsewhere.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH,
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, St. Andrew Square, Edinburgh, / Newton Grange, Newbattle, Dalkeith, } Scotland.

BLUE PRINTS of all kinds in any weather. Drawings and Tracings promptly executed.
J. L. Featherstone, 21, Old Queen Street, Westminster, S.W.

TO GAS AND WATER OFFICIALS.

SPECIAL and Favourable Terms for CYCLES are offered. The very best "up-to-date" Cycle at a reasonable Cost. "Dunlop" Tyres, Weldless Tube throughout, "Westwood" Rims, "Brook's" Saddle, "Perry's" or "Renold's" Chain, &c. The whole combining to make as fine a Machine as is possible to be made. Satisfaction guaranteed. Send at once for Catalogue post free.
Melrose Cycle Company, Coventry.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
Read Holliday and Sons, Limited, Huddersfield.

PURE, Faultless Thorium (High Lighting Power guaranteed) supplied Regularly and on Moderate Terms.
Address J. Y. 6965, care of Rudolf Mosse, Berlin, S.W.

FOR SALE—A Station Meter complete, in thorough working order. Recently overhauled and certified correct by Messrs. Braddock. Capacity, 50,000 feet per hour.
Apply to John H. Darby, Brymbo, near Wrexham.

GAS-PUMP for Sale, horizontal, one Steam Cylinder, 18-inch bore, and two Gas Cylinders, 17½-inch bore, all 24-inch Stroke, on massive Bed-Plate, with heavy Fly-Wheels. Very strong. First-Class Make. Not much used.
Apply, by letter, to No. 2878, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

SPECIAL Bargains—6000 Cubic Feet per hour EXHAUSTER, £27; and STATION METER, £35. 20-inch GOVERNOR, £65. SCRUBBERS 5 ft. by 15 ft., £24; 5 ft. by 30 ft., £48. Four PURIFIERS and CENTRE-VALVE, complete, £75. GASHOLDERS, 50 ft. by 18 ft. and 44 ft. by 14 ft.
Address No. 2919, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

COUNTY BOROUGH OF SALFORD.
(Gas Department.)

THE Gas Committee invite Tenders for the purchase of about 700 Tons of SPENT OXIDE.
Further Particulars and Form of Tender may be obtained from the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed tenders, addressed to the Chairman of the Gas Committee, endorsed "Spent Oxide," to be sent to me not later than Three p.m. on Thursday, Oct. 7, 1897.
Saml. Brown,
Town Clerk.
Town Hall, Salford,
Sept. 17, 1897.

NEWPORT (MON.) GAS COMPANY.

HYDRAULIC MAIN AND RETORT-FITTINGS FOR SALE.

THE Directors of the above Company invite TENDERS for Six lengths of CAST-IRON ⊃ HYDRAULIC MAIN, with Standards, Ascension-Pipes, Dip-Pipes, Buck-Staves, and Tie-Rods to correspond.
Full Particulars can be obtained from the Engineer.
Tenders to be sent in addressed to the Chairman of the Newport (Mon.) Gas Company on or before Wednesday, the 6th day of October, 1897, endorsed "Retort-Fittings."
The Directors do not bind themselves to accept the highest or any tender.
By order,
Edward F. Marfleet,
Secretary.

THE Corporation of Blackpool are prepared to receive TENDERS for their surplus TAR (about 2000 Tons) produced during the Year from Oct. 1, 1897.

Tenders, endorsed "Tender for Tar," to be sent in by Saturday, the 25th of September.

Particulars may be had from the undersigned.

JOHN CHEW,
Engineer.

Gas Office, Blackpool,
Sept. 14, 1897.

RAMSGATE CORPORATION.

TENDERS FOR GASHOLDER.

THE Gas and Water Committee are desirous of receiving TENDERS for a Three-Lift GASHOLDER; outside lift, 115 feet diameter.

Tenders to be sent in, addressed to the Chairman of the Gas and Water Committee, Hardres Street, Ramsgate, not later than Ten a.m. on Monday, the 11th of October.

Full Particulars will be given on application being made, enclosing cheque for £3 3s., which will be returned on receipt of a *bond-fide* tender, to

WILLIAM A. M'INTOSH VALON,
Engineer.

ISLE OF THANET GASLIGHT AND COKE COMPANY, MARGATE.

THE Directors of the above Company are prepared to receive TENDERS for the supply of about 300 Tons of OXIDE OF IRON (Genuine Bog Ore), and also for the purchase of a quantity of SPENT OXIDE.

For Specification and all Particulars, apply to the Engineer and Manager, Mr. H. H. Jones.

Separate tenders, endorsed on the cover "Tender for Oxide of Iron," or "Tender for Spent Oxide," to be delivered at these Offices not later than Thursday, the 30th of September, addressed to the Chairman of the Company.

The Directors do not bind themselves to accept any tender.

By order,
THOS. C. FULLER,
Secretary.

Gas-Works, Margate,
Sept. 18, 1897.

ISLE OF THANET GASLIGHT AND COKE COMPANY, MARGATE.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the above Company are prepared to receive TENDERS for the surplus TAR produced at their Works from Oct. 1, 1897, to the 15th of June, 1898.

For all Particulars as to Quantity and Terms of delivery, apply to the Engineer and Manager, Mr. H. H. Jones.

Tenders, endorsed "Tender for Tar," and addressed to the Chairman of the Company, to be delivered at these Offices not later than Thursday, the 30th of September.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
THOS. C. FULLER,
Secretary.

Gas-Works, Margate,
Sept. 18, 1897.

By Order of the Directors.

THE SOUTHEND WATER-WORKS COMPANY.

SALE OF 500 SHARES.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Tuesday, the 19th of October, at Two o'clock, in Lots, 500 £10 SHARES (to be issued as fully paid) in the above Undertaking, ranking for a Maximum Dividend of 7 per cent.; the Dividend to the 30th of June last on the same class of Shares being at the rate of 5¼ per cent. per annum.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND GAS COMPANY.

SALE OF SHARES.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, London, E.C., on Tuesday, the 19th of October, at Two o'clock, in Lots, 29 £10 SHARES in the Southend Gas Company, ranking for a Standard Dividend of 7 per cent.; the last Dividend on the same class of Shares having been at the rate of 7½ per cent.

Particulars of the SECRETARY, at the Offices, SOUTHEND, and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

GAS STOCKS AND SHARES
IN THE
SOUTH METROPOLITAN GAS COMPANY,
NEW SWINDON GAS COMPANY,
UXBRIDGE AND HILLINGDON GAS COMPANY.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, E.C., on Tuesday, the 19th of October, at Two o'clock, in Lots, STOCKS AND SHARES in the above Companies.

Particulars may be obtained of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Power.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 29th inst., at Half-past Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect two Directors and one Auditor in place of those who go out by rotation, but who are eligible to be re-elected.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 18th inst., and RE-OPENED on the 30th inst.

By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
Sept. 8, 1897.

THE GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £50,000 SIX PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £212 10s. PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL by TENDER £50,000 of NEW SIX PER CENT. PERPETUAL DEBENTURE STOCK, to be issued under the Powers of The Gaslight and Coke Company Act, 1876.

Particulars and Conditions, with Form of Tender, may be obtained on application at this Office; and Tenders must be sent in so as to be received here not later than Twelve o'clock (noon), on Monday, the 27th inst.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Sept. 17, 1897.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc M.Inst.C.E., F.C.S.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

Now Ready, Price 10s. 6d.

WARNER'S DIAGRAMS
OF THE ANNUAL
AVERAGES OF PARLIAMENTARY RETURNS RELATING TO GAS UNDERTAKINGS,
1887 TO 1895.

Together with the Private and Public Undertakings Grouped—1895 and 1896 Workings.

COMPILED BY
W. J. WARNER, of South Shields.

These Diagrams, which were noticed in the "JOURNAL" for Aug. 24, 1897, may be had of

WALTER KING, 11, Bolt Court, FLEET ST., E.C.

THE WHOLESALE FITTINGS CO.,
37, COMMERCIAL ROAD,
LONDON, E.
(M. ALTMAN, Proprietor).

CHEAPEST HOUSE FOR
INCANDESCENT GAS-FITTINGS,
WHOLESALE AND EXPORT.
THE BEST BURNER IN THE KINGDOM,
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Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
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Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
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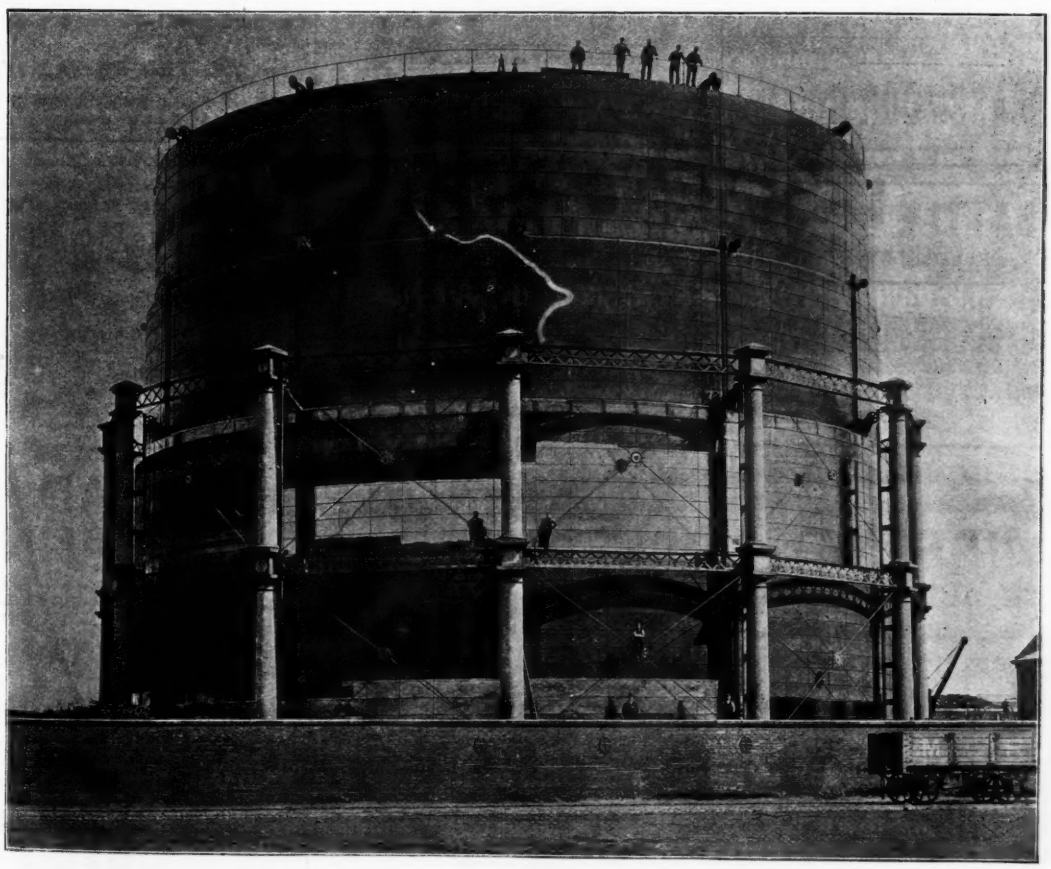

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Coke	66·7	Coke.
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Coke (of good quality)	67·5 per Cent.
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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

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Illuminating Power	17·8 candles.
Coke	70 per cent.

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Yield of Gas per ton	10,500 cub. ft.
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Coke	73·1 per cent.

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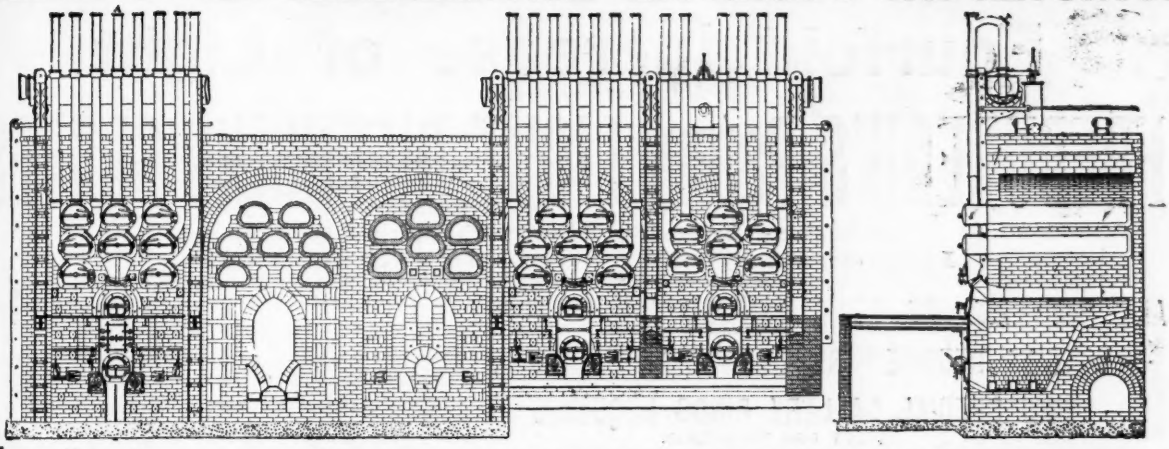
HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 17 TO 20 CWT. OF ENGLISH AND 20 TO 24 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, Hamilton, Agent for Scotland and Ireland; Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B., and to whom all Inquiries should be addressed in the first instance.

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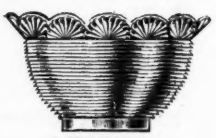

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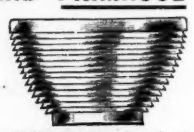

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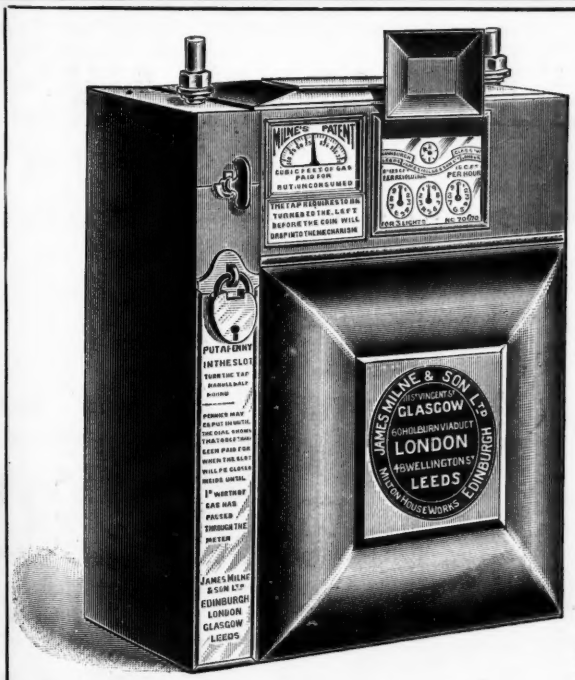

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	,,	,,	1/8	,,		2/0
	,,	,,	3/9	,,		5/2
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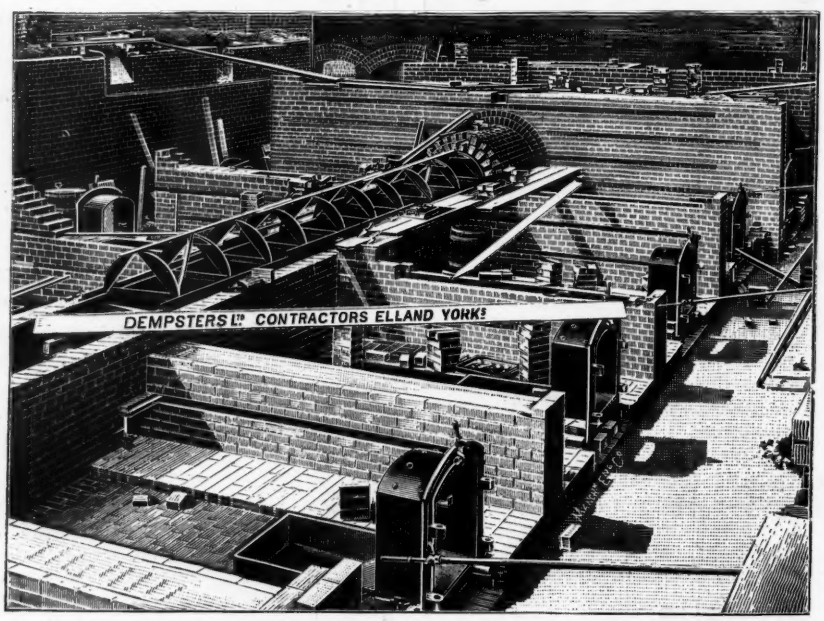

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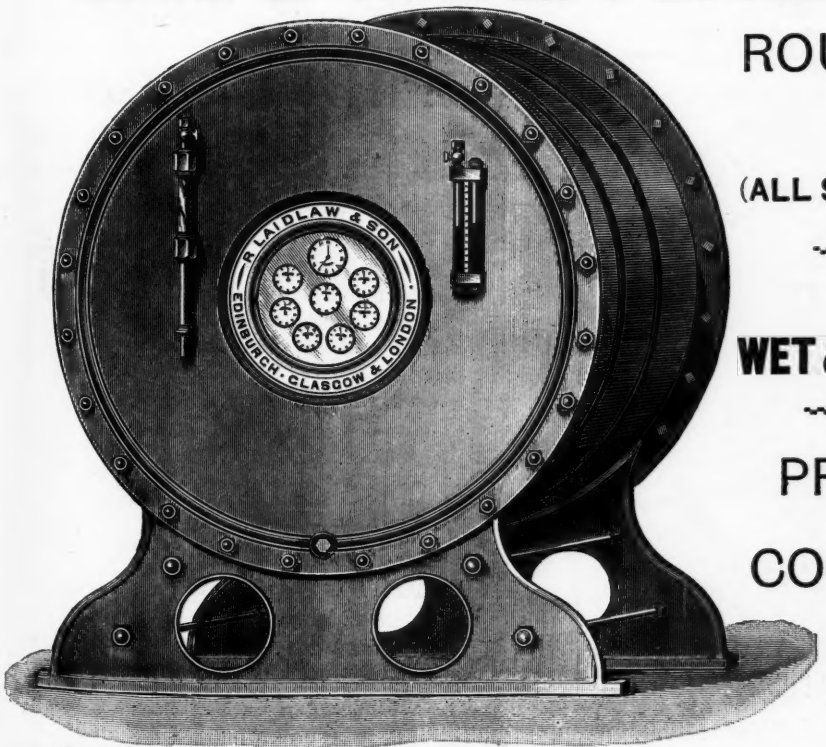

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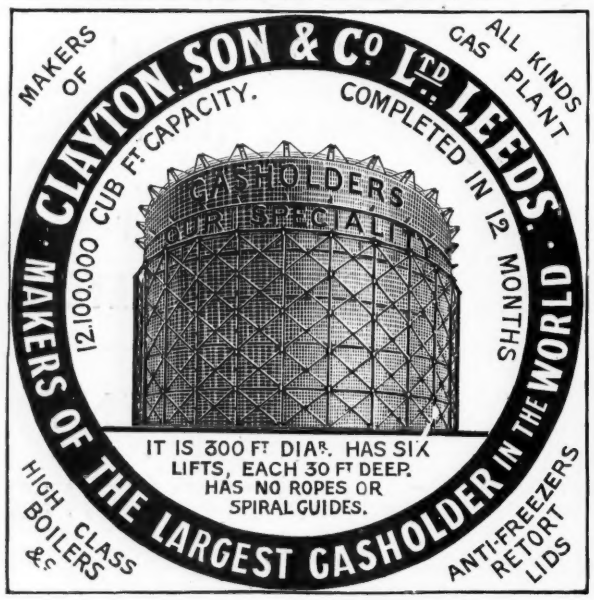
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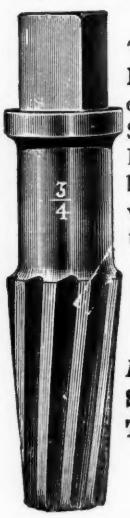

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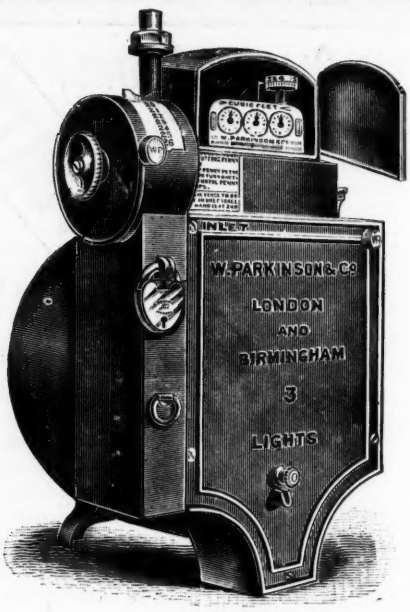

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[See also Advt. p. 624.

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